Influencing Individually: Fusing Personalization and Persuasion

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Personalized technologies aim to enhance user experience by taking into account users' interests, preferences, and other relevant information. Persuasive technologies aim to modify user attitudes, intentions, or behavior through computer-human dialogue and social influence. While both personalized and persuasive technologies influence user interaction and behavior, we posit that this influence could be significantly increased if the two technologies were combined to create *personalized and persuasive* systems. For example, the persuasive power of a one-size-fits-all persuasive intervention could be enhanced by considering the users being influenced and their susceptibility to the persuasion being offered. Likewise, personalized technologies could cash in on increased success, in terms of user satisfaction, revenue, and user experience, if their services used persuasive techniques. Hence, the coupling of personalization and persuasion has the potential to enhance the impact of both technologies. This new, developing area clearly offers mutual benefits to both research areas, as we illustrate in this special issue.

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1. INTRODUCTION

In an effort to alleviate the pressure placed on information seekers in trawling through the abundant resources available, the advent of *personalized* information services has come about. These services aim to enhance user experience and assist users in achieving their goals by taking into account their interests and preferences, as can be seen in search engines, social applications, navigation support tools, and many other applications [Brusilovsky et al. 2007; Mobasher et al. 2000]. *Persuasive* technologies attempt to shape, reinforce or change behaviors, feelings, or thoughts about an

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issue, object, or action. This can be achieved through software support for carrying out tasks, computer-human dialogue, credible advice, or social influence [Fogg 2003; Oinas-Kukkonen and Harjumaa 2009]. Persuasive technologies provide new abilities that make a desired behavior easier to achieve, and simulate compelling experiences that can effectively persuade users, or create relationships through a variety of cues to establish trust and to support a desired change. These technologies are often exploited to persuade users to maintain a healthy lifestyle, to be environmentally friendly, or to purchase certain products. Although both personalized and persuasive technologies aim to influence user interactions or the users themselves, little work has been done in either area on incorporating techniques proven to work in the other. Most persuasive applications employ a one-size-fits-all approach to the delivery of persuasive interventions, failing to deliver personalized persuasion that leverages user characteristics and preferences, or to provide personalized tools that assist users in achieving the intended goals. Personalized technologies use sophisticated modeling and understanding of user preferences to provide personalized services, but fail to cash in on increased success that could potentially be achieved, if their services were supported by state-of-the-art persuasive communication.

The implementation of *personalized and persuasive technologies* would enhance the impact of either personalized or persuasive technology applied in isolation. Personalized systems would benefit from incorporating persuasive techniques to gather valuable user information, increase uptake of recommendations, and improve the quality of service and the overall user experience. Persuasive systems could adapt the type and intensity of the persuasive interventions to the preferences and characteristics of each individual user, thus upgrading their persuasive capabilities. We propose that the impact of the combination of these technologies would exceed the impact currently seen by them applied independently, and predict an increased interest in investigating their fusion from both research communities.

In this preface, we take the opportunity to introduce a conceptual framework for personalized and persuasive technologies. We discuss several categories, scenarios, and existing work, where the fusions of personalized and persuasive technologies is already underway, and highlight opportunities for future research that could advance this area.

2. WAYS IN WHICH PERSONALIZATION CAN ENHANCE PERSUASION

According to Oinas-Kukkonen [2012], behavior change support systems are the primary focus of research in the area of persuasive technologies. Persuasive technologies convey persuasive interventions through carefully chosen language, interface, and modality to influence users' behavior and perceptions, and different goals and strategies may be applied by persuasive systems to support different outcomes and behavior change strategies. A key challenge, in particular for mass persuasion, is that often the target audiences are large and heterogeneous, and include users with wide-ranging goals, needs, and preferences. Thus, influencing the entire audience effectively with a one-size-fits-all persuasive intervention is difficult.

The persuasive research community is aware of the potential of adaptation and tailoring, as illustrated through the use of names in communication, adaptation to user input, and delivery of tailored feedback. In addition to existing strategies, we propose that information relating to the target user could be exploited to personalize the persuasive intervention itself, such that the message conveyed, the interface used, or the timing of the intervention could be personalized to the user being targeted. The proposed fusion of persuasion and personalization encourages the use of deeper user modeling and personalization techniques throughout the persuasion process. Table I

Table I. Fusion of Personalization in Persuasive Technologies

Tool – increases capability to achieve goals by	*Medium* – provides compelling experience by	*Actor* – creates social relationship with users by
- monitoring progress of parameters important to user - providing contextualized and personalized suggestions - adapting textual feedback: content, mode, language, method, delivery, interface	- showing personalized cause-and-effect scenarios - facilitating realistic simulations for each user - predicting future activities of the user - providing personalized simulated objects	- providing personalized language cues - tailoring interaction to user's cultural diversity - adapting relationships to user's social circle - facilitating service tailored to user's behavioral norms

shows different roles that can be taken by persuasive technologies and ways to personalize these.

2.1. Personalization to Strengthen the Impact of Persuasive Technologies

We propose three natural opportunities for personalization in persuasive systems: personalized *assistive features* focus on monitoring and presenting information about aspects of importance to a user; personalized *messages* tailor the content as well as the look and feel of the information in order to meet users' communication preferences; and personalized *strategies* focus on responding to a user's susceptibility to various persuasive techniques and methods.

Personalized *assistive features* of persuasive systems may act as facilitators that assist users in achieving their goals in an easy and simple manner. Persuasive systems are often unresponsive to the preferences of the users and fail to monitor progress with respect to parameters that are important for them. By incorporating personalization, which understands the desired change and adaptively supports the user in achieving this change, the persuasive power of the system could be leveraged. They could monitor on users' behalf, provide guidance and support, or even provide encouraging personalized feedback. An example of such tools would be a personalized exercise planner in a persuasive fitness application. The planner would recommend a fitness routine, which considers the fitness level, injuries, exercise preferences, location, and weather, with the aim of generating a plan that is appealing to and achievable for that user.

Personalized *messages* offer a powerful form of communication. They can enrich persuasive systems through adaptive delivery of the interventions, which reflect the preferences of the individual using the system. The language, modality, font, layout, and many other characteristics of the messages can be personalized, allowing users to relate more to the information, service, and persuasive technique being used. In addition, the content displayed to an individual can be adapted to a user's preferences, tailored to the observed contextual conditions, and certain information can be highlighted or removed. The information can be delivered at appropriate times (morning, evening), through the most appropriate medium (email, SMS), and according to the preferred frequency (daily, weekly). The above exercise planner could deliver its recommendations through contextualized just-in-time messages, supported by appropriate language, visual style, and multimedia content.

A core area, which has been thus far under-investigated, is that of personalized persuasive *strategies*, where the type of intervention itself is adapted to a user's personality, behavior, and susceptibility to various forms of persuasion. We posit that this personalization has a huge untapped potential to maximize the impact of persuasive applications. There are multiple dimensions that the exercise planner could potentially personalize in this scenario, such as the credibility of the information sources,

tone and style of the intervention, inclusion of animated avatars, or application of authoritative language to name a few.

2.2. Practical Examples

There are relatively few studies that successfully incorporate personalized techniques or features into persuasive systems. Dijkstra [2006] studied the impact of personalized smoking cessation messages, which gave smokers personalized feedback on their smoking. The system provided to users generic information on the dangers of smoking and personalized information pertaining to their smoking habits. After completing a computerized questionnaire, one cohort of smokers was presented with the generic information, while another with personalized information. The results showed that after four months, the personalized feedback led to significantly higher levels of smoking cessation than standard non-personalized feedback. In this case, the persuasive power of the information presented to users was increased by adapting the information to the reported smoking level of each individual.

The physical activity motivating game design is a persuasive gaming concept which leverages enjoyment of computer games to encourage players to perform mild physical activity while playing [Berkovsky et al. 2010]. The design persuades users to perform physical activity by making the game more difficult and offering virtual in-game rewards in return for activity. Initial evaluations showed that the persuasiveness of the design (in terms of encouraging activity) was related to a player's gaming skills, such that better players performed less activity. Thus, a personalized application of the design was developed, which adapts the difficulty of the game to a player's skills, in order to stabilize the persuasive power of the games. This successfully balanced the amount of activity performed by different players without affecting their willingness to be persuaded. The use of personalization in this example shows how responding to the characteristics of individual users can leverage the impact of a persuasive application.

Nguyen et al. [2007] investigated the connection between a persuasive argument and the characteristics of the users being persuaded. They developed models for the discrepancy between a user's and an argument's positions, the strength of the argument for the user, and the user's involvement with the topic of the argument. Users were modeled through a set of sample arguments, which they were asked to rate. The evaluation showed that modeling was an important step towards accurately predicting the users' response to an argument and that it should be applied when selecting the most appropriate argument to be presented by a persuasive system. The personalized selection of arguments can streamline the persuasion task and make the desired behavior or attitude change easier to achieve.

3. WAYS IN WHICH PERSUASION CAN ENHANCE PERSONALIZATION

The aim of personalized applications is to provide relevant information or services to users based on their preferences and needs. Personalization often takes place in recommender systems, information filtering and information retrieval systems, directed Web navigation, e-learning platforms, shopping assistants, and many other online services [Brusilovsky et al. 2007]. Personalized systems build and sustain user trust and loyalty through the provision of intelligent support adapted to user requirements.

The personalization cycle can be broadly divided into two components: user modeling and personalized service delivery. The former focuses on the mining and extraction of the required user information from observed interactions with the system. The latter focuses on the development of accurate personalization algorithms and provision of the actual service to users. Figure 1 illustrates the personalization cycle, the

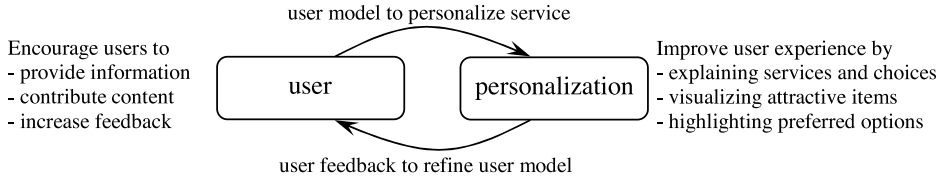

Fig. 1. Fusion of persuasion in personalized technologies.

information exchanged between the two components, and the ways in which we suggest its enhancement through persuasive technologies.

3.1. Persuasion to Increase Uptake of Personalized Technologies

The key fusion points for persuasion in personalized systems lie in the user-related functional areas, which we denote by persuasive *user experience* and persuasive *data acquisition*.

The most general way in which persuasion could be included in personalized system is through the information, language, media, and communication modes used by the system. Persuasive use of attractive avatars, praise, and humorous language will improve *user experience* and the users will be more likely to use the system again. To establish and successfully sustain user enjoyment, designers of personalized systems have to consider the power of the social role, which has been successfully investigated in the persuasive research. In addition, personalization systems may benefit from explaining to users the reasoning behind a recommended or filtered item(s), or suggested information. Explaining to users the system's behavior builds up trust, which, in turn, increases both user loyalty and the uptake of the services. For example, consider a personalized recommender system deployed by an e-commerce Web site. The recommender would exploit persuasive technologies to explain the recommendations and make them look attractive to users, thus, increasing their uptake.

Personalized search engines, navigation aids, learning tools, and recommender systems require accurate information pertaining to their users in order to provide personalized services. This information can take the form of explicitly provided user data or implicit data learned from the observed user interactions. Acquiring rich and reliable user information has been a major challenge for personalized technologies. We propose that persuasion could be used to encourage users to provide more information, alleviating the *data acquisition* challenge. The use of persuasive language, praise, and rewards can encourage users to provide more information. Persuasive tools, such as monitoring, reminders, and suggestions, can play an important role in increasing the amount of content contributed by users, especially in social media applications. In addition, the persuasive power of simulated scenarios can be leveraged to demonstrate quality enhancements that could potentially be achieved if more user information was available to the system. The above-mentioned e-commerce recommender would ask users to rate the purchased items or to offer users the opportunity to answer relevant questions posted by other users in order to learn their preferences and encourage contribution of user-generated content.

3.2. Practical Examples

Work on the persuasive nature of personalized systems has become popular as research into the interaction, presentation, and user interfaces of personalized systems has attracted increased attention. Often, however, work that focuses on encouraging users to provide information and follow recommendations—which are clearly persuasive users tasks—is not labeled to indicate this.

Herlocker et al. [2000] examined the compelling nature of textual explanations that supports recommendations in movie recommender systems. They evaluated in a live user study 21 variants of explanations, ranging from algorithm-specific to domain-specific information. The most influential or persuasive explanations were discovered to contain visual representations of information about the ratings of like-minded users, information on the past accuracy of the recommendations provided by the system, similarity of the recommended movie to other movies already seen by the user, and information on the presence of the user's favorite actors in the movie. These are all visual cues that convey persuasive messages, which explain the nature of the recommendations and increase user trust.

Farzan and Brusilovsky [2009] investigated the use of persuasive cues in a personalized navigation support system. This work evaluated the role of visual social cues (icons representing the amount of reading and annotation by other users in the community) in persuading users to take up recommendations for relevant documents and, thus, simplify their navigation. It was discovered that showing cues relating to the actions of other users in the community successfully affected user behavior and that users followed these cues when seeking relevant information. The results were discovered to depend on user factors (degree of trust) and on contextual factors (time availability), which affected the perceived usefulness or persuasiveness of the cues. In this example, the inclusion of visual persuasive cues affected the uptake of services provided by a personalized navigation support system.

Felfernig et al. [2007] proposed that the presentation of recommended items and the presence of other items influence user choices within the recommendation set. They analyzed the position and decoy effects in recommendation lists and their impact on the persuasiveness of the recommended items. The evaluation showed that the perceived utility of a recommended item changes in the light of the surrounding items and that position effects are important in the design of item comparison pages. Specifically, the appeal of items changed when similar, but better-value or higher-specification, items were shown close to the recommended item. They investigated methods to determine the ordering and decoy strategies that can effectively persuade users to consume a recommended item. Thus, including decoy items in recommendation lists can be considered a persuasive strategy aimed at boosting the attractiveness of target recommended items.

4. ARTICLES IN THE SPECIAL ISSUE

Three works exemplifying the application of personalization in persuasive technologies and of persuasion in persuasive technologies were accepted for publication in this special issue.

"Adaptive Persuasive Systems: A Study of Tailored Persuasive Text Messages to Reduce Snacking" by Kaptein, De Ruyter, Markopoulos, and Aarts presents a persuasive system aimed at changing the eating habits of users by encouraging reduced snacking. Persuasive interventions of the system were delivered through mobile text messages, which were personalized according to users' susceptibility to various influence strategies. A two-week study involving more than 200 users compared the impact of three types of messages and discovered that personalized messages were more effective than non-personalized ones. This article is among the first to practically demonstrate the potential of personalized persuasive strategies (see Section 2.1), and pave the way for further research in this direction.

In "Investigating the Persuasion Potential of Recommender Systems from a Quality Perspective: An Empirical Study," Cremonesi, Garzotto, and Turrin experimentally assess the persuasiveness of several TV program recommender systems. A

six-month-long large-scale user study, which measured the capability of recommenders to increase sales and diversify of video content consumed by users, was conducted. It was found that user acceptance of personalized recommendations is higher than of non-personalized ones, that the level of acceptance increases over time, and that the recommendations increase consumption of long-tail, that is, not popular, items. Thus, this article exemplifies the power of persuasive personalized user experience (see Section 3.1) in modifying the behavior of users and their interaction with a recommender system.

Finally, "System Personality and Persuasion in Human-Computer Dialogue" written by Andrews investigates the integration of user characteristics in the generation of persuasive human-computer dialogue. Specifically, the work evaluates the impact of considering a user's degree of extraversion on the perceived persuasiveness and trustworthiness of a system. Two studies, involving more than 140 participants, ascertain the dependencies between a user's personality, the perceived personality of the system's arguments, and the impact of the persuasive dialogue. The number of support statements in the generated arguments was found to determine the perceived quality of the interaction. Hence, this article demonstrates the practical natural language generation application of *personalized persuasive messages* (see Section 2.1).

5. DISCUSSION

The potential impact of fusing personalized and persuasive technologies is tremendous. However, their fusion also raises a number of technological and ethical issues, which can influence and motivate future research in this area.

Emerging opportunities. Most existing online persuasive strategies are digital reflections of well-established offline strategies studied in behavioral research. However, Web-based and mobile environments offer a cardinally new paradigm and opportunities for new persuasive research. For example, social networking systems offer opportunity for persuasion through strong and weak ties. How can these online contexts provide opportunities to produce novel online persuasive strategies for personalized persuasion?

User modeling. The user modeling process, which is required to realize personalized persuasive strategies, is a challenging task. The construction of persuasion-related user models requires explicit information about user susceptibility to various forms of persuasion. This information is not readily available and is unlikely to be successfully learned from the implicitly observed system interactions. So how do we progress in effectively gathering user modeling data that can facilitate the provision of accurate personalized persuasion?

Ethical issues. The introduction of personalized persuasion can lead to an ethical dilemma, as user requirements may conflict with a system designer's intentions, in particular in commercial applications. For example, the primary goal of e-commerce sites is to increase sales and revenues, whereas the users are interested in purchasing products reflecting their needs and abilities. How should we balance what is best for the user and the commercial realities facing the service provider when delivering personalized persuasive interventions?

In summary, the fusion of persuasion and personalization is a highly promising and appealing area for both scientific research and practical design. We would like to invite academics and practitioners to elaborate these ideas and help advance the field with influential and targeted solutions.

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