

What do we know about behavior change support systems after a decade of annual meetings?

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Abstract

This paper discusses the current Behavior Change Support Systems (BCSS) issues. Persuasive technology and BCSS applications and services have shown promising results in motivating and supporting individuals to change behaviors and attitudes or adopt new ones. A conference on BCSSs was organized in Eindhoven, the Netherlands to explore more about this. The registered authors of the accepted papers presented their research papers physically on site, and in-depth discussions were carried out with 28 participants. The results suggest that additional research in designing and developing such digital interventions and research into their user experiences is still needed.

Keywords

Behavior Change Support Systems, Persuasive Technology.

1. Introduction

Technology has become a significant part of modern life, from sensors and trackers to processing power as never before, with profound implications for almost every aspect of our daily lives. More precisely, gadgets and devices such as smartphones and watches, fitness trackers and monitors, and wearable sensors offer great potential to utilize Persuasive Technology (PT) towards behaviors with which individuals, society, and the environment can significantly benefit [1-4]. Behavioral design is rapidly becoming incorporated into user interaction (UX) design, and persuasive systems can become seamlessly integrated into daily life.

The many applications and services offered through Persuasive Technology and Behavior Change Support Systems (BCSS) have shown promising results in motivating and supporting individuals to change or adopt new behaviors and attitudes in various fields and domains such as health and wellbeing, sustainable energy consumption, education and research, and business and marketing. Persuasive technology is a comparatively new discipline and many of the interventions followed by its concepts, such as for promoting physical activity in the workplace, have demonstrated effects over a short time [5]. However, many of the health challenges facing individuals worldwide are chronic long-term illnesses such as metabolic syndrome, diabetes, obesity, depression, hypertension, etc. These diseases demand that the afflicted individual engages in long-term behavior change throughout 5, 10, or 15+ years. There is an increasingly urgent need to *develop an understanding of BCSS constructs, tools, models, and evaluation methodologies to enable long-term behavior change* and predict long-term effectiveness and acceptability of proposed BCSSs.

The conference intended to bring together multidisciplinary researchers, practitioners, and experts from various scientific fields, such as information sciences, social science, psychology, human-

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computer interaction, industrial design, medical technology, and medicine This acts as a forum where experts from multiple disciplines are able to share their ideas, present their innovative work, and discuss and debate the current unsolved challenges for persuasive technology.

In the following sections, our vision and challenges, new research directions in engaging persuasive technologies, and BCSSs will be presented and discussed. A BCSS is defined as “a socio-technical information system with psychological and behavioral outcomes designed to form, alter or reinforce attitudes, behaviors or an act of complying without using coercion or deception” [6].

2. Background

Whether healthy lifestyle-related actions or managing a chronic or long-term illness, behavior change requires longevity with the help of sustained use of a system or in terms of lasting effects. Where it is necessary to empathize and understand the immediate and rapid effects of BCSSs on behavior, it is also essential to highlight the necessity for a broader time-span view on the use and effects of these systems. For instance, with chronic illnesses such as hypertension, diabetes, stress, or depression, the diagnosis and following treatments are often merely the beginning for the patient, who then enters a lifelong self-management process regarding the individual's condition. Similarly, a long-time favorite of the persuasive technology field and BCSS interventions, obesity [7], is a slow process where overweight that is collected over the years will also take years to take off. Other behavioral areas, from well-being to ecological behaviors, often involve a more sustained learning and rehearsal curve, and systems that remain supportive for the users beyond a few weeks or months could potentially lead to behavior change that is still effective years later. Modern digital technologies allow us to collect more significant amounts of objective data from multiple sources, e.g., multi-sensor and self-tracking data, that can be used for personalization and customization. In previous times, it had been focused on small, exact datasets and causal connections (i.e., knowing "why"); advances in big data cause a paradigm shift towards the linkage of large amounts of (noisy) data to demonstrate the presence of (unexpected) correlational connections (i.e., knowing "what") [8]. While this opens exciting new frontiers of research, also significant issues have been raised as well related concerns like safety and user-friendliness, profiling, purpose limitation, liability, data ownership, and (above all) the privacy issue [7-10]. Such issues should be dealt with more appropriately to enhance the people's trust and obey in technological growth.

The persuasive technology field has become a prime hotspot that connects natural and social sciences, requiring a holistic view of persuasive technologies and multi-disciplinary techniques for design/co-design, development, implementation, and evaluation of the applications and services. To date, the capacities of technologies to change behaviors and to continuously track the progress and effects of interventions are not being applied to their full range. Specific aspects and features of the intervention (it's content or the system) contribute to the outputs, and user adherence remains unclear and unknown, known as the 'black box' phenomenon [11].

Using information technologies as persuaders may shed new light on the interaction process of persuasion, influencing habits, attitudes, and behaviors. Yet, human-computer interaction is social by nature, and citizens often see computers and technology-mediated devices as social actors; it is still quite unknown how these interactions reshape attitudes, beliefs, and emotions or how they change behavior and what the drawbacks are for persuasion via technologies. Humans re-configure technology, changing their goals from time to time during their usage.

This means persuasion is not a static ad-hoc event but a spontaneous and infinite process. Validated and suitable evaluation methods and mixed methods approaches are essential to measuring persuasive technologies' involvement, engagement, emotions, and social influence in smart and digital environments.

BCSSs pose several specific challenges, such as personal goal setting and self-determination, personalized feedback, support for computer-enhanced communication, 24/7 availability, feasible business frameworks, and suitable methods and processes to develop scalable software platforms and architectures for these systems.

3. Recent transformations with the annual meeting

The BCSS workshop has been organized annually since its inauguration in 2013. In spite of its name the BCSS workshop has been organized since its very beginning in the conference style even if in conjunction with the International Conference on Persuasive Technology. In this year the BCSS changed its name, and it was called the conference rather than workshop. Six papers were accepted to be presented in the conference. The review of all the submissions were single-blinded, peer-reviewed by at least two or more reviewers, and then a third reviewer finalized the paper status. Covid restrictions were still a limitation to getting more participants involved; hence, we had a hybrid mode of conference facilitated this year. A total of 52 participants attended out of which 28 attended on site.

4. Contributions

The accepted paper contributions covered a range of topics and approaches to behavior change. Bootsma and Ciocarlan [12] discussed in their work a persuasive intervention designed to improve children's attitudes toward drinking water. They highlighted the importance of personalization and tailoring interactions to younger age groups in promoting health behaviors among children.

Sharma et al. [13] aimed to gain insights into the information communication needs of informal caregivers providing home care to community-dwelling older adults with cognitive impairment living alone. The authors found that caregivers require specific information about falls, agitation, nocturnal unrest, and typical daily life scenarios.

de Oliveira et al. [14] described about the development of a mobile health application for postoperative cardiac surgery patients. This mobile app was designed to provide digital support to patients during their recovery period and improve their overall health outcomes.

Ozono et al. 2023 in their work [15] focused on promoting prosocial behavior, precisely garbage disposal behavior, through an intervention method using an inducement. The study evaluated the effectiveness of visualizing the saturation of a trash can through a colored light that changes color to red, yellow, and green. The findings suggest that this method positively impacts attitude changes and psychological effects related to garbage disposal behavior. The authors plan to improve the hybrid intervention and verify its effectiveness in longer-term experiments.

In their work, Haque et al. [16] explored the impact of peer-review feedback on the interpersonal relationships between Ph.D. students and their supervisors from a self-determination theory perspective. The study concluded that peer-review feedback could promote positive relationships between Ph.D. students and their supervisors, which is essential for reducing feelings of isolation and improving retention rates in research programs.

Oinas-Kukkonen et al. in their work [17] described one master's level persuasive technology teaching program in a 2-year information systems program. This is an important step forward as persuasive technology education previously has been neglected largely by the persuasive technology research field.

In conclusion, the BCSS conference suggests that there needs to be more work on BCSSs precisely in designing and developing interventions and to obtain still a deeper understanding of BCSS user experience over time.

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