

# Bibliographic Analysis of Persuasive Systems: Techniques, Methods and Domains of Application

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**Abstract.** This paper presents findings of our study on peer-reviewed papers published in the International Conference on Persuasive Technology from 2006 to 2010. The study indicated that out of 44 systems reviewed, 23 were reported to be successful, 2 to be unsuccessful and 19 did not specify whether or not it was successful. 56 different techniques were mentioned and it was observed that most designers use ad hoc definitions for techniques or methods used in design. Hence we propose the need for research to establish unambiguous definitions of techniques and methods in the field.

**Keywords:** Theories, methods, systems evaluation, system features

## 1 Introduction

The application of interactive technology for changing human behavior continues to attract attention both in research and the industries. However, there is inadequate empirical knowledge on the range of techniques, methods and application domain. As such, we seek to understand how persuasive technology (PT) designers have applied theories, methods and techniques across the various domains. We reviewed applications published in the International Conference on Persuasive Technology from 2006 to 2010. We envisaged that this will provide researchers with information on existing PT applications and provide clues to issues that need attention.

The remainder of this paper presents the motivation of the study followed by the methodology used for review, then findings, discussions and conclusion.

## 2 Research Motivation

Researchers such as Torming et al [1] have conducted similar studies by evaluating full papers in Persuasive Conference proceedings from 2006 to 2008 using the Persuasive Systems Design (PSD) Model [2]. They established that most of papers published were experimental with 84.4% addressing behavior change instead of attitude

change. They also observed that tailoring, tunneling, reduction and social comparison were the most studied techniques whereas competition and verification were less discussed. In another study, Lehto and Oinas-Kukkonen [3] observed that reduction, self-monitoring, simulation, and personalization were the most used techniques for accomplishing user's primary task support as compared to tailoring when they evaluated web-based applications with the PSD. In both studies the terminologies used were redefined to conform to the system features of the PSD model thus less detailed information was made available on methods or techniques used by the researchers. Hence, we seek to evaluate existing persuasive applications and identify theories, methods and techniques that have been used for designing them.

### **3 Method**

For the sake of coherence, we reviewed proceedings of the Persuasive Conference series from 2006 to 2010. Ideally it would be more appropriate to review all PT applications published, however the vast number of publications makes it impossible to do so with any keyword. Also, in order to ensure an appreciable standard and quality, the Persuasive series was used, since it is the only comprehensive conference on PT. In all, we identified 53 papers that discussed a PT application, however 44 were selected based on the definition of PT [4, 5]. A catalogue was developed based on: name of system, type of interface used, domain of application and change type. Particularly, we considered the intention of the designer to either change attitude towards target behavior (ATTB) or current behavior (CB) as defined in [6].

### **4 Findings**

Contrary to the findings by Tarning et al [1], 23 (52.3%) of the 44 reviewed papers were intended to change behavior. This disparity may be attributed to our study considering ATTB whereas theirs consider attitude and behavior, hence they may have considered systems designed for ATTB as changing behavior. As mentioned by Tarning et al [1] and, Lehto and Oinas-Kukkonen [3] most of the papers failed to provide a clear definition of the reviewed system. Also, it was observed that 23 (52.3%) systems were reported to be successful and 2 (4.6%) unsuccessful whereas 19 (43.2%) did not specify whether or not the system was successful.

Our findings also indicated that majority of systems are designed for health promotion. Incidentally, all the Persuasive conference proceedings since 2006 were dominated by themes related to health promotion. This also confirms the claims [7] that PT has a potential of providing effective solutions to preventive healthcare. 11 (25%) were designed for environmental issues whereas 4 (9.1%) were for commerce and 3 (6.8%) for education. The number of applications designed for security and leisure recorded one each and one paper did not specify the domain of application [8].

In order not to redefine terms and meanings of techniques used, a list of all words used for defining techniques, methods or system features in the reviewed papers was created and tabulated. A total of 56 techniques or methods were listed and we ob-

served that the most frequently used was feedback (see Table 1). 19 (43.2%) papers mentioned feedback as a technique or method for changing behavior or attitude towards the target behavior followed by self-monitoring and suggestion which recorded 16 each, representing 36.4%. Social role was used in 11, whereas tailoring and tunneling was used in 10. Reminder was mentioned in 9, and rewards and reduction in 7. In all, 8 out of 21 applications designed to change ATTB used simulation or feedback and 6 used self-monitoring. For applications designed to change behavior, self-monitoring recorded 11 out of 23 whereas 9 used reminders. Suggestion was also used in 8 applications designed for health as compare to 4 in environmental applications. Feedback was mostly applied in applications designed for health or environmental issues with a record of 9 each. Also, a total of 15 theories, frameworks or models were recorded. 24 (54.6%) papers did not specify the theory or framework used; in this 11 were designed to change ATTB whereas 13 were for behavior change. The most applied framework was the Fogg's functional triad [4] with 13.7%. The transtheoretical model, TTM [9] was used in 4 applications designed to promote healthcare. The rest of the theories recorded a frequency of one. Interestingly, the PSD model [2] was not identified in any application.

**Table 1.** Ten most used persuasive techniques in applications from 2006 to 2010

Technique/ Domain of application	Commerce	Education	Environment	Health	Leisure	Security	Total
Feedback	1		9	9			19
Self-Monitoring	1		2	11	1	1	16
Suggestion	1	2	4	8		1	16
Social role	1	1	1	7		1	11
Simulation			5	4	1		10
Tailoring	1	1		7		1	10
Tunneling	1	1		6	1	1	10
Reminders		1		7	1		9
Reduction				5	1	1	7
Reward			2	5			7

## 5 Discussion and Conclusion

One cannot rule out the fact that PT design methods continues to be one of the most compelling issues in the field as most designers apply ad hoc methods for design. This might be due to the interdisciplinary nature of the field making most designers tend to apply models in their respective domain which have been proven to be successful in

human-human persuasion (observe that the TTM was mostly used for developing health related applications). Nonetheless, there is a need for investigations to ascertain whether this approach to design is effective. Another issue which appears to be overlooked is the definition of distinct techniques or methods. Although one may argue that the 56 techniques identified can be classified into a smaller number as in the case of the PSD model, there is the need for further research to establish a clear understanding of terms and vocabulary used in the domain. The current ad hoc adoption of terms for techniques may further inhibit the use of a well-structured procedure for designing PTs. For instance, [10] claimed that the persuasive technique employed in persuading users to conserve water was feedback. However, their provision of an ambient display suggests a technique which can also be considered as self-monitoring. In most cases a designer's definition of a technique or method engulfs a number of other techniques or methods hence making it challenging to identify distinct methods or techniques without ambiguity. As such it will be more helpful if a separation can be made between techniques and methods in persuasive technology.

We thus propose that there is the need for the creation of a "Persuasion Techniques Catalogue" which will guide researchers on distinct definitions of terms and emphasize that the systems features in the PSD model can be expanded with a well-defined distinction between methods and techniques.

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