Association for Information Systems
AIS Electronic Library (AISeL)

MCIS 2011 Proceedings

Mediterranean Conference on Information Systems (MCIS)

2011

# USING GREEN IS TO ENCOURAGE RECYCLING BEHAVIOR

Ana Cardoso
*University of Minho*, anachcardoso@gmail.com

João Álvaro Carvalho
*University of Minho*, jac@dsi.uminho.pt

# USING GREEN IS TO ENCOURAGE RECYCLING BEHAVIOR

Cardoso, Ana, Algoritmi Center, University of Minho, Campus de Azúrem 4800-058 Guimarães, Portugal, anachcardoso@gmail.com

Carvalho, João Álvaro, Algoritmi Center and Department of Information Systems, University of Minho, Campus de Azúrem 4800-058 Guimarães, Portugal, jac@dsi.uminho.pt

## Abstract

*There is nowadays a growing awareness of the importance of taking better care of the environment. People often refer energy conservation and recycling as relevant ways of contributing to a better environment. In terms of recycling, the management of solid waste and residues involves collaboration with consumers and retailers that need to sort out their waste and dispose it in appropriate bins. Thus, the formation of recycling habits is largely dependent of providing the right information and the means to the citizens in order to have them doing their part.*

*Recycling is part of an everyday routine for many persons in Portugal, but official statistics report that the percentage of materials recycled is still low, comparing to the European Union's average. In the last two decades there has been a great effort in terms of television-based communication campaigns to encourage the separation of recyclables. Other media, such as Internet, are also used to campaign, mostly via the institutional websites of the collecting organisations. This results in a reasonable amount of information about recycling on-line but also dispersed, sometimes vague and much technical.*

*This paper argues the provision of adequate information as a means of encouraging recycling behaviour. An Internet-based information service and the related research project are presented. The project aims at understanding the impact of this service on recycling behaviour based on a field experiment.*

*Keywords: recycling behaviour, green IS, field experiment.*

# 1 INTRODUCTION

Waste and residues are a by-product of consumption. With a growing and highly consumerist world population living mostly in cities, the volume of generated waste and residues continues to grow. One characteristic of residues is that they can easily become apparently invisible: once people drop the waste out of their house it becomes someone else's problem. Environmental concerns such as climate change, energy and potable water shortage, loss of biodiversity, and pollution, are creating a momentum and a growing supporting movement (sometimes referred to as The Green Movement) to make organizational practices and individual behaviours more environmentally sustainable.

The information systems (IS) area is also being influenced by The Green Movement. A recent stream of research emerged with the name green information systems (green IS), which refers to the development of information systems that foster more sustainable business processes (Watson et al 2008). In certain cases, green IS addresses the provision of information that enables more sustainable practices in organizations. However, not all the aforementioned challenges of environmental sustainability are solved with more adequate information or with the automation of information processing. For example, human behaviour associated to proper disposing of waste and residues depends on a variety of aspects that go beyond the provision of the right information at the right time. Encouraging recycling behaviours typically involve human interaction and other forms of stimulus. As these might involve information, they can also fall within the realm of green IS.

Consumers and organisations are becoming more aware of the environmental-related problems they may face in near future. Nonetheless, an asymmetry between their convictions and behaviour remains (Sachero and Molla 2009), (Chung and Leung 2007). In a preliminary study about decision making on information and communication technology (ICT) infrastructure, Sachero and Molla (2009) note that, despite the increasing awareness of the environmental impact of ICT, cost and technological factors prevail over environmental related ones.

Moreover, Chung and Leung (2007) observed a discrepancy between attitude towards recycling and behaviour among undergraduates of Hong Kong University. Despite nearly all students sharing a favourable view of environmental responsibility and green purchasing, only 42% self-reported recycling habits. Furthermore, researchers even disconfirm this percentage to a significant lower value, based on observation in situ of the frequency of visits to the recycling area.

We argue that this asymmetry between environmental attitudes and behaviours can be shortened with the supply of adequate information. Moreover, we present the project *Recycle More* (translation from the Portuguese name Reciclar Mais), an information service enabled by an ICT application that intends to organize dispersed information available (and missing) on the Internet about the proper disposing of residues, in order to facilitate and increase the adoption of recycling and reducing waste habits in Portugal.

The project *Recycle More* will be used to investigate the impact of that ICT application on recycling behaviour, namely the combination of features and persuasive elements that are more effective in both encouraging recycling behaviour and maintaining the interest of users on using the information service. For the evaluation of results, a field experiment with a small number of municipalities or universities' campuses will be conducted.

The rest of this document proceeds as follows. Section 2 is about the relevant background for this topic. In Section 3, we introduce the project *Recycle More*, its main features and objectives. Section 4 is a short description of the research plan for this project. The document finishes with Section 5 where we present some concluding remarks.

# 2 BACKGROUND: RECYCLING BEHAVIOUR AND PERSUASIVE TECHNOLOGY

Conservation behaviours, as for example recycling waste and reusing products, have been widely studied in the past, namely its economical, environmental and behavioural aspects. These are also concerns related with Green IS area (Watson et al 2008). Research on Green IS focuses on understanding how information systems (IS) can contribute to more sustainable business practices (Watson et al 2010). In this context, understanding the role of IS in facilitating and influencing behaviours such as recycling waste is a problem relevant for the area.

Hitherto, research in green IS has addressed mostly the organisational context. For example, Chen et al (2008, 2009) propose a conceptual model that explores institutional theory as a lens to better understand how IS can motivate organisations to act towards environmental sustainability. Besides organisational practices, individuals' behaviour is also an interesting context of study for green IS. In fact, we do not know much about the behavioural and design issues related with the role of IS as a facilitator and enhancer of pro-environmental behaviours. Particularly, little is known about what artifact works better, in what circumstances and for whom (Melville 2010). Thus, research that progresses knowledge about effective design methods for developing green IS that influence users' behaviour is certainly useful.

The behavioural aspects of recycling have been widely studied in the areas of environmental and behavioural psychology. On an extensive study, Hornik et al (1995) summarize results of previous literature and identify the following variables as determinants of recycling behaviour: extrinsic incentives, intrinsic incentives, internal facilitators, and external facilitators. After a meta-analysis of 67 empirical studies, they conclude that incentives are usually successful at activating the recycling behaviour, but other factors can ignite and sustain recycling behaviour, namely: perceived satisfaction, commitment, locus of control, knowledge and social influence. The last two, knowledge and social influence, are the strongest predictors of recycling behaviour.

A similar result is conveyed by Oom do Valle et al (2005). Their study combines constructs of the theory of planned behaviour (Ajzen 1985), the model of altruistic behaviour (Schwartz 1977), the model of environmental behaviour (Grob 1995), and the model of environmental concern (Stern et al 1995) into a comprehensive structural model of recycling behaviour that tests data collected in Portugal with a survey about self-reported recycling habits. Results suggest that the theory of planned behaviour is adequate to explain recycling behaviour. Thus, important predictors of recycling behaviour are subjective norm, perceived behaviour control and attitude. Moreover, specific knowledge, perceived convenience, and satisfaction with the features of the recycling collection program increase the perceived behaviour control and hence the recycling behaviour.

Incorporating persuasive technology (Fogg 2003) elements in ICT applications that process information about recycling and residues may be helpful in influencing beliefs and actions about the environment and encouraging behaviour change. Persuasive technology is defined as any interactive ICT designed to influence user's attitudes or behaviours, without using coercion or deception (Fogg 2003). These interactive ICT can have different roles, considering the perspective of the user: roles of tool, medium, and social actor (Fogg 2003). Each of these roles elicits a different response from users and a different technique of persuasion is therein appropriate.

Hence, an interactive ICT tool can be persuasive by providing tailored or customized information that facilitates the intended behaviour, monitoring users behaviour, making timeliness suggestions, reducing the complexity of tasks for an easy change of behaviour, and giving positive reinforcement to users. On the other hand, an interactive ICT medium can persuade mostly through simulations where cause-effect relationships are explored, behaviours are rehearsed, or pretending experiences are created. Finally, the purpose of an interactive ICT social actor is to create relationship with users. In this case persuasion takes the form of modelling behaviour, providing support, and developing a sense of affinity and empathy with users.

There are two different levels of persuasion: macro and micro. At the macro level technology is designed with the ultimate goal of persuading, as for example ICT applications that help users controlling weight. Conversely, the micro level involves the incorporation of persuasive techniques to attain a particular goal as for instance selling products. For example, amazon.com's website uses some of these techniques, namely the suggestion of recommended products and the provision of customized information.

# 3 THE PROJECT: RECYCLE MORE

Recycling practices in Portugal are similar to other European countries, with the drop-off collection method being widely used. Industrial waste has specific issues that are regulated by law. There has been a great effort in communication campaigns in the past two decades in order to improve the percentage of recyclables collected. The National Bureau of Statistics in Portugal (INE) notes however that recycling in Portugal is still about 57% of European Union's average, with only a meagre 13% of residues generated being recycled (INE 2010).

One of the barriers that prevent the separation of residues is that people often do not know how to separate. Another problem is the lack of information about the collection process. The objective of the project *Recycle More* is to overcome these barriers. Moreover, it leverages the potential of ICT to contribute to the adoption of the general environmental goals of recycle, reduce, reutilize, rethink behaviour, and refuse non eco-friendly products.

*Recycle More* is planned to be an information service enabled by an ICT application that provides detailed information about the correct disposing of different types of residues. The service will detail information about the geographical location (in map, with GPS coordinates) of the collection points of residues of different types and also the collection points of products no longer used that can be reused. Information will be searchable by place, city, type of residue or product, and collecting organisation.

Users, either individual or organisations, may create profiles and share information about collection points, campaigns, and tips for recycling and reusing products. An aggregator of news and topics about environment conservation will also be included. Workshops, campaigns, significant legislation and contacts of organisations involved will also be available.

Another feature of *Recycle More* is that it will permit the insertion of geographical location of collection points in the map by its users. Thus, it can be updated fast and with low costs. Also, collaboration of the collectors is expected to facilitate the update of its database.

Some information about recycling and correct disposing is already available on the Internet but is often incomplete, vague, dispersed and difficult to find. For example, the Agency for the Environment in Portugal (APA) has recently published in their website a list with the collection points for used cooking oil in different municipalities (APA 2010). This list is a document with 53 pages, limited navigability because of broken links, and incomplete. For instance, the municipality of the first author of this paper has several other collection points that are not included in the list.

Besides widely known recyclables, such as paper and cardboard, glass, cans and plastic containers, there is nowadays in Portugal a vast number of other residues that can be collected. Materials can be collected for different purposes. For example, used furniture may be disposed as waste, recycled, or donated to non-governmental organisations that help needy families. The residues and products that are not separated in Portugal are sent to landfills or incinerated. However, some of these residues could be recycled in other countries, where technology and costs make it economically viable. Thus, it is not desirable to make consumers aware of these aspects so they can make informed decisions and adapt their behaviour.

# 4 RESEARCH PLAN

The project will investigate the impact of *Recycle More* on recycling behaviour. The main objective is to answer the following research question: what combination of features and persuasive elements of the ICT application most contribute to motivating recycling and reusing behaviour? Expected results are an explanatory model of how ICT applications might be used to influence pro-environmental behaviour. This model constitutes a contribution to the design of successful green IS because it provides a sound basis for supporting design decisions related to IS features that impact human attitudes and behaviour. Therefore, the primary goal of such model would be prescriptive (Gregor 2006) and aim at describing an optimal structure for the design of such systems.

Figure 1 is an adaptation of Hevner et al's (2004) research framework that shows the most relevant aspects of this project.

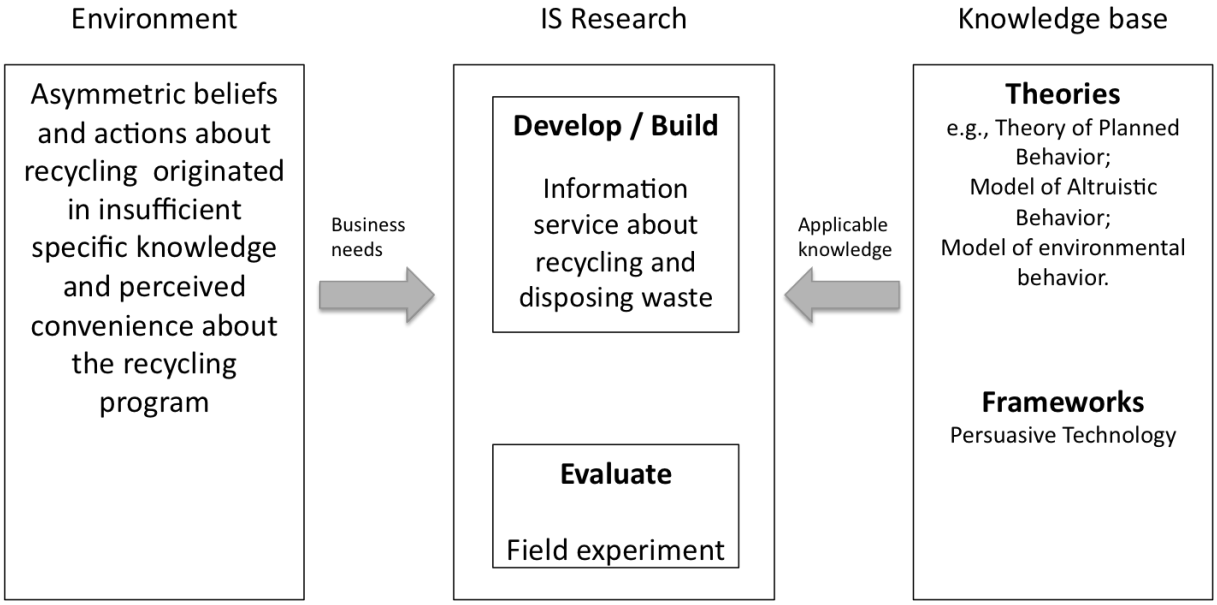


*Figure 1. Research framework for Recycle More. Based on (Hevner et al 2004)*

The project outline includes the development of the ICT application that supports the *Recycle More* service and a field experiment involving its use in a small number of municipalities or universities' campuses. The experiment will be used to gather data about the adoption and use of the *Recycle More* service. Results of this research are relevant and useful for the design of ICT applications and IT-based services that intend to influence pro-environmental behaviour.

# 5 CONCLUDING REMARKS

Despite efforts of communication and increasing awareness of the importance of conservation behaviours, there remains an asymmetry between the beliefs about the importance of recycling and reusing products and actual behaviour. In Section 2, we identify the variables subjective norm, specific knowledge, perceived convenience, and satisfaction with the features of recycling collection program as predictors of recycling behaviour, based on the results of an empirical study conducted in Portugal (Oom do Valle et al 2005).

Conservation behaviours such as recycling are of interest for Green IS, an area that is concerned with developing IS that contribute to environmental sustainability (Watson et al 2008). A better understanding of how green IS should be designed in order to encourage pro-environmental behaviours is certainly useful for the success of such systems. Thus, this article briefly presents a

project of a new information service conveyed by an ICT application entitled *Recycle More* (in Portuguese, Reciclar Mais) that aims at organizing information related with recycling residues and reusing products in Portugal.

The project consists of a comprehensive aggregator of relevant environmental information related with sustainable consumption in order to facilitate the collection of recyclables and reusable products and, hence, reduce its environmental impact. *Recycle More* will provide information about the collection points for recyclables and reusable products, its geographical location, instructions about the separation process, and tips about reusing products and reducing residues. An experiment with a small number of municipalities or universities' campuses will enable to investigate the impact of such information service on recycling behaviour. The goal of the project is to uncover the combination of features and persuasive elements that are more effective in encouraging recycling behaviour.

## Acknowledgments

This research is supported by Fundação para a Ciência e Tecnologia via Bolsa de Doutoramento SFRH/BD/60838/2009.

## References


Watson, R., Boudreau, M., Chen, A., and Huber, M. (2008). Green IS : Building Sustainable Business Practices. Global Text Project, Atlanta, Georgia.

Sacchero, S.D. and Molla, A. (2009). Environmental considerations in ICT infrastructure decision making. In Proceedings of Pacific Asia Conference on Information Systems. Paper 2.

Chung, S. and Leung, M. (2007). The Value-action Gap in Waste Recycling: The Case of Undergraduates in Hong Kong. Environmental Management, 40, 603-612

Watson, R., Boudreau, M., and Chen, A. (2010). Information Systems and Environmentally Sustainable Development: Energy Informatics and New Directions for the IS Community. MIS Quarterly 34(1), 23–38.

Chen, A., Boudreau, M., and Watson, R. (2008). Information Systems and Ecological Sustainability. Journal of Systems and Information Technology 10(3), 186-201.

Chen, A., Watson, R., Boudreau, M., and Karahanna, E. (2009). Organizational Adoption of Green IS&IT: An Institutional Perspective. In Proceedings of International Conference on Information Systems. Paper 142.

Melville, N. (2010). Information Systems Innovation for Environmental Sustainability. MIS Quarterly 34(1), 1-21.

Hornik, J., Cherian, J., Madansky, M. and Narayana, C. (1995). Determinants of Recycling Behavior: A Synthesis of Research Results. Journal of Socio-Economics, 24(1), 105-127.

Oom do Valle, P., Rebelo, E., Reis, E., and Menezes J. (2005). Combining Behavioral Theories to Predict Recycling Involvement. Environment and Behavior, 37(3), 364-396.

Ajzen, I. (1985). From Intention to Actions: A Theory of Planned Behavior. In J. Kuhl & J. Beckman (Eds.), Action control: From cognitions to behaviour, 15-39. New York: Springer-Verlag.

Schwartz, S. H. (1977). Normative influences on altruism. In L. Berkowitz (Ed.), Advances in experimental social psychology, 221-279. New York: Academic Press.

Grob, A. (1995). A Structural Model of Environmental Attitudes and Behavior. Journal of Environmental Psychology, 15, 209-220.

Stern, P. C., Dietz, T., & Guagnano, G. A. (1995). The New Ecological Paradigm in Social Psychology Context. Environment and Behavior, 26, 723-743.

Fogg, B. (2003). Persuasive Technology: Using Computers To Change What We Think And Do. Morgan Kauffman Publishers, San Francisco.

INE. (2010). O sector dos resíduos em Portugal: 2004-2009. Available at http://www.ine.pt/ngt_server/attachfileu.jsp?look_parentBoui=95453848&att_display=n&att_download=y

APA. (2010). Pontos de Recolha de Oleos Alimentares Usados. Available at http://www.apambiente.pt/politicasambiente/Residuos/fluxresiduos/OAUsados/Documents/Pontos%20de%20Recolha%20OAU%2027%20Out%2010.pdf).

Gregor, S. (2006). The Nature of Theory in Information Systems. MIS Quarterly 30(3), 611-642.

Hevner, A., March, S., Park, J., and Ram, S. (2004). Design Science in Information Systems Research. MIS Quarterly, 28(1), 75-105.