1. Abstract

In this paper, the key elements of a Web portal for sustainable consumption are introduced. The pieces of information – news, background articles, and advertisements – are ranked according to two criteria: Their potential to reduce the users’ ecological footprint and their costs. In order to be able to do this, the control engine of the Web portal uses three sources of information: (1) a personal profile prepared by the user with the help of a personal ecological footprint calculator, part of the portal; (2) an ontology on sustainable consumption; (3) a database on ecological footprint reduction measures, containing the potential of the measure as well as its costs.

With the Web portal, a so called “integrated lifestyle package” of information and information services is built, providing the necessary width of coverage for widespread use.

2. Introduction

The emphasis on sustainable consumption and production (SCP) has been growing significantly over the past years, as consumption has been recognized as a point of intervention with high potential in the protection of the environment. The World Summit on Sustainable Development in Johannesburg in 2002 agreed SCP to be one of the three priorities to achieve sustainable development. The UNEP Marrakech Process is defining a 10-year framework programme to be discussed in the 2010-2011 cycle of the UN Commission on Sustainable Development. Sustainable consumption patterns is a topic of the Fifth Environmental Action Programme of the European Union (CEC, 2002) and an action plan for sustainable consumption and production has also been issued (CEC, 2008).

Sustainable consumption means that a thinking and learning process has to take place across the whole society. Behaviour and consumption patterns typical today have to be replaced in a process of some years by new, sustainable patterns. Where we live, what we eat, how we travel – all these must change significantly for most people, meaning also changes in our work. In addition, the importance of agriculture and agricultural areas will increase.

In consumer decisions, pieces of information collected on the Web already have a crucial role, Web 2.0 approaches compel companies to change their traditional marketing strategies and become much more open to consumer feedback.

Information and communication technology (ICT) devices and applications are getting more and more powerful and affordable, as opposed to natural resources, such as energy. This will continue further even in a declining economy and generally rougher conditions. Yet, in the Marrakech process and the EU’s Action Plan a notable omission is that the potential contribution of ICT to sustainable consumption is not considered. In fact, even in the literature of computer science for environmental protection, sustainable consumption is rarely discussed. The aim of this paper is to
sketch a framework for a sustainable consumption portal. Particular emphasis is put on the engine filtering and ranking the pieces of information, news, advertisements etc.

3. Related work

3.1 Environmental portals

Environmental information portals, such as the leading German environmental portal Portal-G or the environmental portals of the German states, do not put an emphasis on sustainable consumption – and they look at the question from the point of view of professionals, not from that of the consumers. This as a misleading message: environmental information portals suggest that we have a right to a clean environment – without having any responsibility for or influence on it. A typical example is when citizens check the air quality/air pollution in environmental information portals in order to find a good place to live – and at the same time do not consider (and do not get any support from the portal to help them realise) how they themselves will pollute the area, as places with clean air are usually reached by private cars.

The Web site of the European Environment Agency\(^1\) presents on each page a hint for sustainable consumption. This is in accordance with the unconventional, but from our point of view very true interpretation of the Aarhus convention of 1998 – giving the conceptual and legal background for environmental information portals – by the director of the Agency: “the public needs to be … empowered to change their own way of living”\(^2\). The hints on the Web site are, however, only initial steps and far from realising all the conceptual and technical possibilities.

3.2 Information systems for sustainable consumption

There is a growing number of (though often prototypical) information systems related to all three major areas of consumption – housing, food/drink and travel – promoting more sustainable consumption. A survey on existing and potential ICT-systems can be found in (Lukács, 2009), though even over the last year a number of new systems and ideas appeared. Also, Web2 approaches are gaining momentum (VfU 2010).

The political and scientific aspects of sustainable consumption and ICT are handled in a comprehensive way in (Marsh, 2009).

A very interesting approach is suggested in (Simmons, 2002) putting the emphasis on lifestyle changes, as opposed to a simple product oriented view. Based on the fact that consumption in developed countries is determined to a large extent by social factors and not by physical needs, it proposes culturally specific Information Society Technology (IST) products and services in the form of Integrated Lifestyle Packages, as a basis for ICT-driven immaterialisation of consumption.

Our work integrates and develops these ideas: an Integrated Lifestyle Package is achieved by integrating single information systems, as well as information such as news, background articles and even advertisements into a single Web portal for sustainable consumption.

\(^1\) European Environment Agency home page –EEA; http://www.eea.europa.eu/

\(^2\) Professor Jacqueline McGlade, Executive Director of the European Environment Agency, at the 10th anniversary of the Aarhus convention, 2008
4. Portal for Sustainable Consumption

4.1 Overview

The portal offers information – background articles, news, advertisements – as well as information services, all supporting sustainable consumption. The major areas of consumption and thus sustainable consumption are housing, eating and drinking as well as travelling. To make the portal widely used, a wide range of issues must be covered. Small systems covering only a few issues get underproportional attention from users as humans tend to retain only a limited amount of information and prefer to concentrate on the most important information source.

There are two major organizing principles for what is appearing on the portal:

the potential for reducing the ecological footprint;
the cost-effectiveness of possible measures.

That is, pieces of information and information services that have the highest potential for reducing the ecological footprint and having the lowest cost will be given priority, while those with little potential and/or having the highest cost will not.

As individual lifestyles, consumption patterns and thus the ways to reduce our footprint vary on a very wide range, the portal should not have the same pieces of information for everyone, but rather, it should be customized to individual circumstances and possibilities.

The major architecture is as follows (Figure 1): A special ecological footprint calculator allows the user to provide information on their individual circumstances. This information is stored in an individual profile. There are two other, general, not individualized sets of data that play an important role in the portal: an ontology covering all relevant concepts for sustainable consumption and a data set of the general potential and the costs of different measures for ecological footprint reduction measures. The engine of the portal combines these three information sources and ranks the pieces of information and the services accordingly. Finally, the mashup-generator is responsible for assembling the individually customized page of the portal.

4.2 Ontology for Sustainable Consumption

There are several ontologies for the concepts of environmental protection, also containing some descriptors on sustainable consumption. As an example, the environmental thesaurus UMTHES\(^3\) of the German Federal Agency for Environment Protection included the following terms: environmentally sound consumption patterns, AT Sustainable Consumption Pattern, conservation-conscious consumerism, environmentally compatible consumption patterns, environmentally conscious consumerism, environmentally friendly consumption patterns. All of these are related only to the concepts energy consumption, fuel consumption, electricity consumption and energy consumption. Obviously, these concepts are not detailed enough for giving individually customized advice for the citizens.

\(^3\) [http://www.umweltbundesamt.de/service/dokufabib/thes.htm](http://www.umweltbundesamt.de/service/dokufabib/thes.htm)
The GEneral Multilingual Environmental Thesaurus (GEMET)\(^4\) of the European Environment Agency has only the following top level concepts in this field: social aspects, population, consumer behaviour, consumption pattern, social-minded behaviour and wastage.

Figure 1: Architecture of the Web-Portal for Sustainable Consumption

We can conclude that current thesauri and ontology on environment protection cover sustainable consumption only at a rather theoretical level with few descriptors and with few links to other descriptors – inadequate for our purposes. Therefore, an ontology is being developed covering all issues on a sufficiently detailed level. The basis for the ontology development are among others detailed ecological footprint calculators, the study on the costs and potential of CO2 reduction measures. Standard tools, such Protege is used for creating and maintaining the ontology.

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\(^4\) http://www.eionet.europa.eu/gemet
4.3 Ecological footprint calculator, individual profiles

The personal ecological footprint (Wackernagel et al. 1996) is the amount of resources used up by an individual’s consumption in relation to the carrying capacity of the Earth, expressed in a very obvious figure (“How many Earths would be required if all people had the consumption level you have”). There are several ecological footprint calculators on the Web, asking more or less detailed questions on the major consumption areas of mobility, food and drink, building and general consumption and calculating the personal ecological footprint.

Figure 2: CO2 reduction measures: their potential and costs in the residential sector in Hungary, 2025 (Novikova, 2008)

In the portal, the ecological footprint calculator is used for two purposes. First it gives the user an overview of its personal ecological footprint – the typical use of ecological footprint calculators. Second – and more interestingly – it allows collecting relevant data that can be used for individually customizing the sustainable consumption portal.

There are two major requirements towards the Ecological Footprint Calculator used for this purpose. First, it has to be sufficiently detailed, asking for a number of details, as opposed to many calculators asking only a few, very general questions. Second, it has to use the concepts of the ontology on sustainable consumption (Chapter 3.2) thus allowing to combine the pieces of information in the personal profile with the general ontology.

4.4 Database on ecological footprint reduction measures: the potentials and the costs

As a third source of information, a database is required on the potential in different measures for reducing the personal ecological footprint and the cost of the measures. As no such database for ecological footprint was available, we used a database on CO2 reduction measures. Although ecological footprint and CO2
footprint are conceptionally different, they often reveal the same trends. Therefore, a CO2-related database can be used for a proof-of-concept control-engine.

The database used (illustrated on Figure 2) is part of a study on CO2 reduction measures (Novikova, 2008). It covers the issue of housing – the issue with the highest potential for energy saving. For a general portal, however, a similar database will have to be set up for the other areas of sustainable consumption, i.e. for food and drink as well as for travelling. The data depends to a large extent on boundary conditions such as local climate or the local architectural solutions. The data available for this project covers Hungary. For several other countries, however, similar studies and databases are available.

4.5 Control Engine

The control engine combines the pieces of information from the three sources – ontology, individual profile, potential/cost of ecological footprint (CO2) reduction measures – and combines them to rank the pieces of information and information services for the portal. One sub-rank is calculated reflecting the relevance to individual consumption patterns (issues with higher than average individual consumption in the personal profile – large potential for improvement – rank higher, issues with low individual consumption – low potential for improvement – rank lower). Another sub-rank is calculated reflecting the cost/benefit of an issue generally. Synonyms and, to some extent, broader and narrower terms from the ontology are considered, too. The individual sub-ranks are then combined together by means of an appropriate weighing function.

5. Conclusions and outlook

In our paper, we presented a Web portal for sustainable consumption, providing individually customized pieces of information on reducing our ecological footprint in a cost-efficient manner. We presented the architecture and draft descriptions of the components: an ecological footprint calculator, personal profiles, ontology for sustainable consumption and control engine for the portal.

This is an ongoing project. Further conceptual efforts will be put into the portal control engine in order to achieve better results, scientifically provably only depending on the potential for ecological footprint reduction and the costs for it.

6. Literature


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