

# Using persuasive technologies for energy consumption management: a South African case study.

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**Abstract** In this paper the authors evaluate Chevron's Energyville, as an example of a persuasive technology, which is used to change attitudes and behaviours. The authors want to explore this simulation in terms of its potential to be transplanted as a persuasive technology into the South African context, given the fact that South Africa is experiencing an energy crisis currently and will continue to do so in the foreseeable future.

**Keywords** Persuasive Technology, Energy, Energyville, Captology, Persuasion, Interactive Technologies, Serious Gaming

## 1 Introduction

This paper investigates whether a web-based simulation, called Energyville, can be used as a persuasive technology to increase peoples' awareness of the impacts of using various sources of energy. Energyville has been designed from a developed country context but the authors want to investigate whether and how it can be used as a persuasive technology in a developing country context. Given the well documented energy crisis currently influencing South Africa, the authors have chosen this country as the basis for their research.

## 2 Definition of Persuasive Technology

Persuasive technology is defined as "an interactive technology that changes a person's attitudes or behaviours." (Fogg, 1998). Attitudes or behaviours concerning education, personal relationships, fitness, environmental conservation, occupational productivity, personal management & self improvement, personal finance, safety, commerce: buying & branding, preventative healthcare, disease management and community involvement/activism are some but by no means all of the attitudes and behaviours that can be subjected to persuasive technologies.

The study of interactive technologies as persuasive technology is called Captology (Fogg, 1998) and includes the design, research, and analysis of interactive computing products created for the purpose of changing people's attitudes or behaviours. According to Oinas-Kukkonen et al. (2008), the majority of persuasive technology research focuses on interactive technologies, such as computer games and mobile devices. The focus of the author's research is on computer games as a persuasive technology.

One of the ways in which interactive technologies can function is as a medium (Fogg, 2002), where these technologies can use both interactivity and narrative to create persuasive experiences that support rehearsing a behaviour, empathizing, or exploring causal relationships. An example here is serious games because players can explore cause-and-effect relationships, as well as providing them with motivating experiences (through reward) and by practising real-world behaviour.

An example of such a persuasive technology is a virtual on-line simulation game called America's Army, which was designed to persuade American citizens to join the Army. It provides the user (person) with an idea of what it would be like

to be in the Army, including the various roles (eg: medic, soldier) that are required as well as the different types of activities that take place (eg: from training to combat). A player can progress through the game by undergoing training and completing missions which allow him/her to move onto the next level (rank). There are currently over 9 million active users of the game which indicates the extent of the potential reach and impact that it can have.

Persuasive technology is based on six key principles, which are defined as follows:

- The Principle of **Cause and Effect**: Simulations can persuade people to change their attitudes or behaviours by enabling them to observe immediately the link between cause and effects (Fogg, 2002)
- The Principle of **Social Learning**: People will be more motivated to perform a target behaviour if they can use computing technology to observe others performing the target behaviour and being rewarded for it (Fogg, 2002)
- The Principle of **Suggestion**: A computing technology will have greater persuasive power if it offers suggestions at opportune moments (Fogg, 2002)
- The Principle of **Tunnelling**: Using computing technology to guide users through a process or experience provides opportunities to persuade along the way (Fogg, 2002)
- The Principle of **Virtual Rewards**: Computer simulations that reward target behaviours in a virtual world can influence people to perform the target behaviour in the real world (Fogg, 2002)
- The Principle of **Tailoring**: Information provided by computing technology will be more persuasive if it is tailored to the individual's needs, interests, personality, usage context, or other factors relevant to the individual (Fogg, 2002).

When applying these principles to America's Army, the finding is that the game can be classified as a persuasive technology as its purpose is to persuade based strongly on the principles of social learning and virtual rewards. This is because the player is rewarded during the course of the game as his/her skill level increases by being allocated to special assignments during which they have the opportunity to engage with other players to perform a specific task, which provides the social learning component.

### 3 Synopsis of Energyville as a Persuasive Technology

In September 2007, Chevron Corporation and the Economist Group, launched a web-based interactive simulation game called Energyville. The purpose of Energyville is to raise awareness amongst global energy users of the impact of utilising various types of energy, namely: biomass, coal, hydro, natural gas, nuclear, petroleum, solar and wind. The impact includes:

- The Economic Impact
- The Environmental Impact
- The Security Impact

The game is based on an industrialised, developed country context where users are challenged to provide power to a city until 2030. When applying the principles of persuasive technology to Energyville the authors found the following:

- The Principle of **Cause and Effect**: Energyville does conform to this principle as it shows users the immediate impact (ie: effect) of using (ie: cause) different types of energy.
- The Principle of **Social Learning**: Energyville does not conform to this principle as users are not able to observe others and the associated rewards.
- The Principle of **Suggestion**: Energyville does not conform to this principle as the game does not provide any suggestions or hints.
- The Principle of **Tunnelling**: Energyville does conform to this principle as users are provided with useful information regarding the different sources of energy during the course of the game in order to persuade them.
- The Principle of **Virtual Rewards**: Energyville does conform to this principle as a user is allocated a point score and given a ranking.
- The Principle of **Tailoring**: Energyville does not conform to this principle as there is no mechanism for customising it to users' specific circumstances.

Based on the findings above, the authors are of the opinion that Energyville can be classified as a persuasive technology. This is because the technology, in this case being a computer game, was

specifically designed for the purpose of increasing people's awareness of the impact of using various types of energy, and in doing so, hopefully persuading them to change their behaviour in terms of energy consumption.

#### **4 The energy crisis in South Africa**

The Energyville game, as stated above, has been tailored to a developed country context, and furthermore one which uses various futuristic technologies (in terms of the games content). South Africa, on which the authors would like to focus, as a country with a less developed energy infrastructure and technology base, is perhaps even more at risk in terms of energy issues.

The electricity supply in South Africa is managed by the para-statal company Eskom Holdings Limited, under the auspices of the Minister of Public Enterprises. Eskom uses primarily coal power stations with one nuclear power station situated at Koeberg in the Western Cape.

In the early years of the new millennium, South Africa's relatively rapid economic development, plus various other factors have resulted in a much higher demand for energy, especially in the industrial and commercial sectors. Due to this higher demand South Africa has been experiencing an energy crisis, impacting especially hard on the mining industry in South Africa, which is one of the largest industries in the country. As stated below by the Eskom website, by 2010 the energy crisis will be having a drastic impact on the South African economy and life in general:

“South Africa's marked economic growth in recent years has propelled electricity peak demand to rise at around 4% a year in a high growth scenario (Eskom Integrated Strategic Electricity Plan). Consequently, unless something is done, by 2007 peak-period demand will exceed Eskom's ability to supply electricity during these periods, and by 2010 additional base load capacity will be required.” (Eskom website)

Especially with the 2010 Soccer World Cup being held in South Africa the issue of electricity demand is a crucial priority for the country. The need to provide adequate electricity now and in the future is one of the major challenges facing South Africa in the coming years.

One attempt at alleviating the demand for energy, and thus reducing the impact of the energy crisis, is a voluntary conservation campaign. The idea behind this campaign, called Power Alert, is to provide warnings as to the consumption levels of electricity over local television stations during peak times. The belief is that alerting the population to the amount of energy they were using would result in unnecessary power usage, e.g. extra lights or appliances left on, being voluntarily curtailed. Further detail is provided by the Eskom website:

“The principle is simple, yet effective. Over three months, a series of four colour-coded messages were broadcast during the evening peak demand period, keeping customers updated on the network status. With the colour-coding came a call to action to switch off certain categories of household appliances, depending on the state of the network (shown in Figure 5 below).” (Eskom Website)

The images mentioned in the quote above are reproduced below:



**Figure 1. Colour-Coded Warning Messages (Adapted from Eskom Website)**

This method of alerting the populace of South Africa has shown marked improvement in energy consumption and usage. One example of this is the increased awareness as shown below:

“DSM’s (*Demand Side Management*) successful marketing efforts saw a 10% increase in initial awareness levels among all target markets over 12 consecutive months.” (Eskom Website) (Author’s italics)

Another example is an increase in the savings of used electricity:

“DSM management again exceeded the 2005 target, realising savings of 171 MW implemented, with energy efficiency contributing 116 MW towards the 171 MW achieved, significantly reducing greenhouse gas emissions.” (Eskom Website)

## 5 The developing context in South Africa

The Energyville game, being a web-based flash game, is targeted at a developed context or country, where widespread internet access allows a large proportion of society to be potential impacted by the game. South Africa is generally classified as a developing country, especially in terms of its ICT (Information and Communications Technology) infrastructure. One example of this is the vast difference in internet penetration as shown by the table below:

**Table 1. Internet Penetration Statistics (Adapted from Internet World Stats website)**

Region	Percentage
South Africa	10.5 %
North America	73.6 %
Europe	48.1 %

This disparity in terms of ICT can be the cause of various communications problems for the society at large in a developing country. This hinders the ability of the government to communicate with its citizens and thus impacts on its ability to affect change:

“Finally, at the regional and global level, developing countries often have limited ability to shape trends, processes and practices that affect their economy and society.” (McNamara: 2003)

This means that a persuasive technology such as Energyville, in its current format, might be limited in changing the energy habits of the South African citizenry and an adapted version is required.

## 6 A Persuasive Technology Proposal

As previously stated the Energyville game, in terms of the six principles of Persuasive Technologies, is not tailored to a South African context, both in terms of the internet capabilities (as mentioned previously) and the types of energy sources and uses in South Africa.

The authors believe that a persuasive technology, such as the Energyville game, but with appropriate changes to context and content, can be used to improve the awareness levels in South Africa to the effects of the energy crisis. Some possible context related changes could be to include new areas into the city the user has to manage that correspond more accurately with the South African context, e.g. informal settlements. Also, seeing as the simulation should focus more on energy consumption than production, the game could allow the user to adjust certain energy using habits in the virtual city and observe their effects. If the general populace were more aware of the effect that their energy saving habits could have on the electricity consumption as a whole, they will be more likely to adapt or improve their energy consumption habits. Added to this, if the game used similar visual cues, e.g. the “dials” shown previously, the players of the game will be able to connect the cause and effects within the game with cause and effects in real life.

Furthermore, with the high mobile phone penetration in South Africa, estimated at more than 90% of the population, a mobile based version of this game could have a much higher impact than a purely web based version. A mobile version could also have opportunities for adding Social Learning elements to the game.

## 7 Conclusion

In this paper the author's explore the possibility of applying a persuasive technology, more specifically an online simulation game called Energyville, which was designed from a developed world context to change attitudes and behaviours with regards to energy usage and it's three-fold impact, to help alleviate the current energy crisis being experienced in South Africa. The authors evaluated Energyville as a potential persuasive technology, and while it is sufficient for use in a developed context, the authors feel that medium will have to be tailored to the developing context in South Africa, in order to make it truly persuasive. Given the low internet penetration rates in South Africa, the authors propose using mobile technology as one possible alternative, due to the high mobile device penetration rate. This would alleviate the need for extensive training, as well as infrastructure investment, because users are already familiar with the technology and the mobile infrastructure already exists.

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