

**Exploring users' practices through the use phase of a television to minimise the
environmental impact**

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Electronic waste¹ (“e-waste”) generates one of the most dangerous categories of waste for both the environment and for human health, since e-waste contains heavy metals and complex alloys (Tanskanen 2013). In response to the growing problem of e-waste, the European Union was one of the first, in 2003, to implement the Extended Producers Responsibility (EPR), through the Waste Electrical and Electronic Equipment (WEEE) Directive (Lifset, Atasu et al. 2013). The EPR obliges producers and importers in European Union countries to reuse and recycle e-waste through environmentally sound methods. In addition to the WEEE directive, the European Commission also passed the Energy-related Products Directive (ErP) in 2005 (Cellura, La Rocca et al. 2014). Its main focus is to improve the energy efficiency of electronic devices. One of the first steps was to cut standby power requirements to one watt or less for most electronic devices (Dalhammar, Machacek et al. 2014). This horizontal policy represents a genuine breakthrough, because it covers a broader cross-section of devices than individual products alone (IEA 2009).

While the EPR approach for electronic products has become an established principle of environmental policy in Canada, the ErP directive has not been implemented in Canada in the same way as in the European Union. The Energy Efficiency Regulations focus on approximately 50 energy-using products, which must meet federal energy efficiency standards in order to be imported into Canada, or shipped from one Canadian province to another (Natural Resources Canada 2015). Although the Regulations and ErP Directive are working to improve the energy efficiency of electronic equipment, the European approach has taken a more holistic approach, since its ultimate objective is to increase overall environmental product performance throughout the entire lifecycle (Déméné 2014).

What is the issue with the consumers?

The legal framework, described above, focuses mainly on the adverse environmental effects

¹ E-waste is defined as a type of waste, consisting of any broken or unwanted electrical or electronic devices.

related to the production and end-of-life sides, and not as much on consumption (also referred to as the life cycle use phase), with the exception of the ErP Directive, which only focuses on energy consumption during the use phase. Although the legal framework has enabled several improvements in product performance, the environmental impact of consumption has continued to increase (Cooper 2013). In this context, there is a need to explore how users actually purchase, use and dispose of their electronic products in order to reduce their environmental impact. Limited research has attempted to explore users' practices framing the environmental impact of electronic appliances during the consumption phase. Most of the current studies have generally focused on a single sub-step of the use phase at a time. This paper aims to illustrate how an understanding of users' practices can provide a sound basis from which it could be possible to strengthen existing policies, in order to minimize the adverse environmental effects associated with the consumption phase of electronic devices.

Why the television as a case study?

The environmental impact of an electronic device depends on its design, including the type of technology used, and the way in which consumers make use of it (frequency, intensity of use for instance) (IEA 2009). The selection of specific electronic goods was wide, and subsequently, this research is focused on the television (TV). Television aptly illustrates many issues related to the use phase of electronic devices, including the rapid succession of technological innovation, changing trends and product price drop, as key factors of obsolescence (Déméné 2014). Moreover, the switch to digital signals and the introduction of High Definition (HD) have accelerated premature end-of-life, and have therefore increased flat screen TV purchases. In this context, the TV case in households can be seen as highly relevant in identifying environmental impacts related to the consumption of electronic products. To reach the objective mentioned above, interviews were conducted among 21 households in the Montreal region for respectively scoping and targeting the users' practices, framing the environmental impact of television' use phase. To this end, six

women and sixteen men were recruited and the information collected is presented in the next section through the key contributions.

What are the key contributions?

Factors leading to the proliferation of electronic products in households

Proliferation of televisions and peripheral equipment

As highlighted in the interviews, after acquiring a television, consumers are prompted to buy new goods, including electronic products, furniture and decorative items. Those purchases are typically intended to harmonize the setting and all of the equipment, both aesthetically and technologically. In the literature, such a phenomenon of multiple purchases is well known as the Diderot effect, in honour of its first observer, the French philosopher Denis Diderot (McCracken, 2001; Park, 2005). Defined as “[a] force that encourages the individual to maintain a cultural consistency in his/her complement of consumer goods” (McCracken, 2001, p.126), the Diderot effect has already been associated with several consumer goods such as cars, clothing, furnishings and cosmetics (McCracken 2001, Shove and Warde 2002), but never with electronic devices. Beyond television, the Diderot effect can be observed across many other electronic goods. For instance, the smart phones can be hooked up to accessories, such as a Bluetooth headset, a car charger or a dock station. In this context, technological innovations have created a favourable environment for the purchase of larger flat-panel TVs and the implementation of the Diderot effect.

Proliferation of display devices, even in the convergence context

While the television has become a multitasking device, the findings show that users own more appliances (i.e. proliferation of televisions and others display devices). With an increasing diversification in product functionality, the number of electronic products per household would have been expected to decrease, leading to significant environmental

benefits. Nevertheless, the opposite pattern has generally occurred with consumer electronics, since nine out of 11 users interviewed still maintain several display devices in their home. As a matter of fact, the more technological advances there are, the more multitasking devices consumers own, and the more appliances they buy. The merger between display appliances, such as television, computer, laptop or tablet might not decrease the environmental impact as expected, because the parallel development of specialized and multitasking devices has increased consumer expectations and the number of household electronic appliances.

The consumer behaviour that shapes growth in energy consumption

Towards a horizontal policy for display devices

Considering that television and all display devices are now in flux, with their respective roles increasingly conflated, political authorities should move towards a horizontal policy. The horizontal measures define targets covering several product groups (IEA 2009, Dalhammar, Machacek et al. 2014). This approach could provide the advantage of lighten existing the regulatory procedures, like energy efficiency policies, by avoiding legislating for each type of product. As mentioned in the introduction, this horizontal policy has successfully been implemented for standby power for most electronic devices. Beyond the standby mode, there are other opportunities for the electronic products to establish interesting horizontal implementing measures. In the case of energy efficiency policies, the main challenge remains how to gather display devices in order to allow the implementation of the horizontal policy. Common features shared with other display devices could define, such as content nature, screen size and portability. In spite of certain difficulties, horizontal implementing measures may become relevant in the future.

Directions to support television's energy performance

These study results emphasize a steady increase in television size among households. In the European Union member countries, there are no specific policies for large televisions, except for the regulation N°642/2009, called ErP Directive (presented in the introduction), which defines standards relative to the size of a television; that is, the larger the television, the higher the allowable consumption will be. In Canada, only television off and standby modes have been subject to Energy Efficiency Regulations (exposed in the introduction). Current policies rely on standards relative to size, but to be effective with regards to large televisions, absolute standards should be adopted. Current regulations will not prevent increases in energy consumption, as long as the legislative gap regarding larger televisions remains. Political authorities should focus on the increasingly popular televisions, 40 inches and up, in order to strengthen existing energy efficiency policies.

Directions to support the energy performance of complex set-top boxes

The proliferation of TVs and peripheral equipment in homes make energy savings difficult. In the case of TV peripheral equipment, set-top boxes (STBs) converting an incoming TV broadcast signal to one that can be seen on a screen, continuously consume energy in both power-on and standby mode, since they are designed to receive information 24/7 (European Economic and Social Committee 2014). In the European Union, standards have already been set for standby mode power for simple STBs through the Erp Directive. Instead of a mandatory measure for complex STB (CSTB),² the European Union has reached voluntary agreements and a voluntary Code of Conduct with manufacturer groups in order to improve energy efficiency (IEA's 4E 2014). In Canada, the Energy Efficiency Regulations (see section introduction) do not take into account STBs and CSTBs. Only, premium

² A Complex Set Top Box (CSTB) is a standalone device equipped to allow conditional access that is capable of receiving, decoding and processing data from digital broadcasting streams and related services and providing output audio and video signals. A CSTB incorporates a great deal of functionality not present in Simple STBs, including (but not limited to) the ability to schedule recordings, the ability to record remotely, the ability to push VOD content to customers, the ability to maintain up to date complex viewing (conditional access) criteria and an ability to maintain large schedule tables, distribute content to other devices within the home, provide high-speed internet access.

efficiency CSTBs are differentiated in Canada through Energy Star certification (IEA's 4E 2014). Beyond these voluntary measures, there is a need to legislate for the CSTBs in order to encourage producers to adopt a high standard of energy efficiency in Western countries, which are significant consumers of CSTBs.

Consumer disposal behaviour regarding electronic equipment

Which alternative for obsolete and functional electronic products?

The findings reveal that more than half of respondents (six out of 11) store their functional CRT televisions, even if they had already purchased a new product fulfilling the same function. While recycling is a preferable option for broken electronic products, what could be done with the functional, but unused electronic devices? Some research proposed to resell functional and obsolete products from Western nations, such as desktop computers, laptops and televisions, to the reuse market in developing countries including Mexico and the Philippines (Kahhat and Williams 2009, Yoshida and Terazono 2010, Kahhat 2012). These imports to emerging nations could be an alternative to extend the lifespan of electronic products, but should be framed by regulations to prevent the shipping of e-waste. Few regulations have focused on the positive environmental and socioeconomic impacts, such as the reuse of personal computers or mobile phones or economic aspects, such as employment generation related to the refurbishment and trade of used electronics around the world (Kahhat 2012). Given this context, more studies are needed to evaluate the environmental, economical and social impact associated with the importation of functional and obsolete electronic devices from developed to emerging nations.

From physical media to the absence of physical media

What will happen to the various obsolete physical media, such as DVDs, VHS cassettes, CDs and other minidiscs, which are used less and less as time goes by? These media are usually not managed by the European and Canadian legislative frameworks. No policy so far deals

with physical media end-of-life, which represents a recycling challenge (especially the VHS cassettes), given the diversity of materials involved and the necessary human resources to recycle physical media. Recycling programs for all media end-of-life need to be developed, since the Blu-ray will soon end up in landfills after being displaced by a new kind of media.

Conclusion

Through technological innovations, users' practices have changed, since they can plug the television in to other devices, and have redesigned their interior space. This study shows that for the television, technological innovations have encouraged the Diderot effect, leading to the consumption of both electronic and non-electronic goods. In fact, the more technological advances that occur, and the more multitasking devices that users own, the more appliances they buy. The findings also emphasized the growing number of unused televisions, peripheral appliances and physical media (DVDs, videotapes) stored in homes, and point out the need to find a sustainable alternative that could optimize the reuse of obsolete devices that no one in developed countries wants any more. In response to these environmental issues, the paper suggests directions for supporting reflections and actions, among political authorities, to reduce the environmental damages related to the use phase, such as horizontal policies for display devices, the establishment of energy consumption standards for large TVs and CSTBs, and the need to provide consumers with information about energy consumption by CSTBs.

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