GREEN-IT: Why Developing Countries Should Care?

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Abstract

Regional and international environmental conferences such as Kyoto and Copenhagen show a growing interest in preserving the environment and addressing major ecological issues, namely climate change and biodiversity. Businesses nowadays are aware that sustainable development is crucial. Social and environmental aspects together with economic performance should be considered

The Information Technology (IT) field has recently embraced the principle of sustainability. Green Information Technology (Green-IT) is the term used for green practices aimed at reducing the impact the IT has on the environment.

This paper has two main objectives. The first one is to offer an understanding of Green-IT. Initially, I will give a theoretical definition of Green-IT as well as an explanation of ecological issues related to IT use, mainly energy consumption, use of toxic substances and e-waste management. I will then present a review of some important Green-IT actions in developed countries.

The second objective consists of shedding light on the importance of Green-IT adoption for developing countries and giving an example of the practice of Green-IT in Morocco.

Keywords: Green-IT, e-waste, green procurement, energy efficiency, sustainability.

1. Introduction

Information technology has revolutionized our modern life and contributed significantly to economic and social prosperity. IT is moving at an incredible pace. Yet, there is a downside to IT expansion.

The increasing use of IT devices (laptop, mobile phones …etc) and their short life span have caused two major problems. First, energy consumption for IT is significantly high especially if we consider the total life cycle of IT products and datacenters' power usage. Second, when discarded, IT devices become waste or what we may call e-waste. The mounting of e-waste poses serious health and environmental hazard because electrical and electronic products contain some toxic materials.

In view of the above concern, IT professionals are now turning to Green-IT in order to develop IT activities in a sustainable manner. In fact, Green-IT includes all practices that aim to reduce the environmental impact of IT use. It is mainly about energy efficiency, environmentally friendly products and proper disposal of IT end of life.

In this paper I will start by defining Green-IT and explaining the ecological issues related to the use of IT. Then I will describe some important actions that helped to encourage Green-IT in developed countries; namely regulation, energy efficiency in datacenter and raising awareness about eco practices.

Finally, I will explain why developing countries should consider Green-IT by discussing e-waste problem and Green-IT opportunities. An example about Green-IT actions in Morocco will be provided at the end of this paper.

2. Definition of Green-IT

Lamb [1] defines Green-IT as "the study and practice of using computing resources efficiently" and Webber and Wallace [2] define Green-IT as "the reduced environmental impact from running an information technology (IT) department". Although those definitions are not precise and do not identify a set of green practices or technologies, they indicate that Green-IT is about considering environmental protection while using IT. Practices like datacenter efficiency, green procurement and e-waste management are only a few of possible Green-IT actions.

Some experts suggest that Green-IT is not only about reducing the environmental impact of IT use but also about using IT as an enabler for businesses to lessen their carbon footprint[3, 4]. This second aspect is sometimes called IT for Green. In this paper, I refer only to the first aspect of Green-IT.

Green-IT is important as a response to ecological issues related to the use of IT. It's mainly about energy consumption, use of toxic substances and e-waste.

- *Energy consumption*: Power needed to operate IT, especially computers and datacenters, is significant. US Environmental Protection

Agency (EPA) estimated that the USA used 61 billion kilowatt-hours of power for data centers and servers in 2006; which accounts for 1.5% of all US electricity consumption. By 2011, this amount of energy could nearly double to more than 100 billion kilowatt-hours [5].

Since energy consumption causes greenhouse gas emission, using IT further increases this emission. Gartner estimated that IT industry accounts for approximately 2% of global carbon dioxide (CO2) gas emissions, a figure equivalent to aviation [6]. Consequently, IT is a part of the global warming issue.

- *Use of toxic substances:* IT industry uses toxic substances in manufacturing and packaging of hardware and software products. Lead, mercury, cadmium and polybrominated flame retardants are examples of toxic substances used in desktop computers [7]. Those substances present risk to human health and the environment in both stages of manufacturing new products and disposing of e-waste. The lack of legislation restricting the use of hazardous substances led to a situation where high amount of those substances can be observed. A study conducted by Microelectronics and Computer technology Corporation (MCC) found that lead represents up to 6.3% of a typical computer which is the equivalent of 2 kg [8].

- *Electronic waste (e-waste):* Due to the increasing demand for IT devices and the continual innovations in this field, the life span of IT equipments is decreasing while e-waste is rising. Global e-waste is growing by about 40 million tons a year [9]. E-waste is a serious concern because electrical and electronic equipments contain toxic substances. Improper treatment of e-waste such as landfilling or incineration contaminates the environment and harms human health.

3. How developed countries encourage Green-IT?

3.1 Regulation

Many countries have environmental legislation related to the use of electrical and electronic equipment. In this section, I will focus on two major European forms of legislation that tackle the restriction of the use of certain Hazardous Substances in Electrical and Electronic equipment (RoHS) and Waste Electrical and Electronic Equipment (WEEE).

The RoHS legislation (directive 2002/95/EC), in force since 13 February 2003, is considered the first legislation in the world that restricts the use of hazardous substances in electrical and electronic equipment. Six toxic substances have been restricted: lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDEs). The concentration value of those substances should not exceed 0.1% with the exception of cadmium for which the maximum value is set to 0.01%.

The WEEE legislation (directive 2002/96/EC) has also come in force on 13 February 2003. This directive is about collection, recycling and recovery of electrical goods. It defines take-back systems where consumers return their used products free of charge and producers have the responsibility to manage properly this e-waste.

RoHS and WEEE have contributed to more environmental commitment on the part of IT industrials. In fact, compliance with RoHS involves finding safe alternatives to hazardous substances whereas compliance with WEEE leads to focus on eco-design of IT products that facilitate their recycling and treatment at their end of life.

3.2 Energy efficiency in datacenters

The significant energy use in datacenter is a big issue for IT professional. From environmental, financial and operational perspectives, it is important to find a way of reducing the datacenters use of energy without compromising the performance. Otherwise, the carbon footprint and the IT bill will explode and the energy suppliers may be unable to satisfy the increasing demand in energy for datacenters.

Coordinated efforts from governments and IT industrials have led to raising awareness about this issue and promoting energy efficiency best practices. Recommendations have been made by European Union in a document named "Code of Conduct on Datacenters Energy Efficiency" [10] which is a good reference for datacenters operators and owners. Also, the Green Grid consortium is a remarkable initiative. It is a global consortium of companies dedicated to developing and promoting standards, measurement methods, processes and new technologies that lead to energy efficiency in datacenters [11].

3.3 Raising awareness

The survey conducted by Forrester in May 2007 confirmed that Green-IT is gaining momentum. It concluded that 85% of IT buyers say green factors are important in planning IT operations. Furthermore, 25% of respondents have written green criteria into their company's purchasing process [12].

Since 2008, Green-IT has featured on Gartner's top 10 strategic technologies list [13] because of its potential growth and the strategic business advantage that may offer.

Nonprofit organizations have played a central role in raising Green-IT awareness. The Climate Savers Computing initiative, started by Google and Intel in 2007, have contributed to the promotion and the development of energy efficiency practices [14]. Greenpeace launched "Cool IT challenge" program in 2009 i n order to "call on Information Technology (IT) companies to power technological solutions needed to fight climate change" [15]. A ranking of companies according to their ecological performance is available in a report called "Cool IT leader board".

4. Why developing countries should consider Green-IT?

The use of information technologies in developing countries is not as important as in the developed ones. Furthermore, developing countries face big challenges such as poverty, illiteracy and diseases. In this context, we may think that Green-IT cannot be a priority. But this new field will be of a great interest when we realize that developing countries are highly concerned by e-waste problem and that Green-IT offers opportunities and allows for economic, social and environmental benefits.

4.1 E-waste problem

E-waste is a real concern for poor countries not only because of the increasing use of electronic and electric devices (mobile phones, laptops, personal computers …etc) but mostly because these countries are a d estination of developed countries' e-waste.

Despite the existence of international and local legislation that ban the trade of toxic waste such as the Basel Convention of 22 March1989 on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, illegal export of e-waste from developed countries to African and Asian countries is still significant and could take sometimes the form of donations.

Gartner revealed that 37 million of computers have ended their life in a poor country in 2008 a nd this number will rise to 69 m illion by 2012 [16]. Germany has estimated that at least 93000tons of e-waste have been exported just via the Port of Hamburg in 2008 [17].

The itinerary and the precise amount of global e-waste exported are not well identified but China is known to be the major dumping ground of developed countries' e-waste [9]. The treatment of

e-waste in the destination countries lies far below standards. Practices like incineration in open area, disposal near poor populations and landfilling are widely used [18]. This leads to dangerous pollution that contaminates the environment and poses serious health problems for the population.

Furthermore, recycling is mainly practiced within the informal sector which employs poor workers and children to recover valuable metals including gold, silver, steel, copper and aluminum without any safety considerations. As a r esult, the health problems among workers are high and the recovery rate is low compared to state-of-the-art industrial facilities.

4.2 Green-IT opportunities

E-waste, which is considered as a major issue, may offer opportunities to developing countries.

Konrad Osterwalder, United Nations Under-Secretary said that "boosting developing country e-waste recycling rates can have the potential to generate decent employment, cut greenhouse gas emissions and recover a wide range of valuable metals" [9]. From this perspective, e-waste is an asset that needs proper treatment to contribute to economic and social development while preserving the environment. To achieve this goal, state-of-the-art facilities should be created and informal sector should be banned and replaced by more organized structures.

Green-IT has also a major benefit of saving energy and consequently reducing greenhouse gas emission. This helps make financial saving and fulfill the commitment made by some developing countries, under the Copenhagen Accord, for greenhouse gas cuts.

4.3 An example of Green-IT practice in Morocco

The kingdom of Morocco has launched many projects for environment and sustainable development. The national charter for environment protection, launched in April 2010, was a remarkable one. It offered an opportunity to spread an eco-friendly culture at national level.

We notice that Green-IT starts to be considered in Morocco through the practice of green purchasing policies. In fact, some public request for proposal include ecological criteria such as energy efficiency and compliance with international standards like RoHS (refer to Appendix). Still, there are no directives or laws that make those criteria mandatory in all public requests for proposal.

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5. Conclusion

Environmental protection requires a holistic approach; hence the importance of coordinated efforts between developing and developed countries to bring an overall solution to environmental issues related to the use of IT.

Green-IT, which refers to green practices that reduce the environmental impact of IT operations, is a nascent field which is gaining ground in developed countries. Many initiatives have been taken by governments and IT industrials in those countries to promote Green-IT practices. Taking advantage from existing initiatives will offer economic, social and environmental benefits to developing countries. For this reason, actions should be taken at different levels (governments, non governmental organizations …) to solve e-waste management problem and to enable more green practices while using IT.

In the future, it would be appropriate to carry out an empirical study to assess Green-IT actions undertaken by developing countries and their effectiveness.

Appendix

"… The competitor is obliged to offer equipments that meet international environmental standards. Such equipments should have lower power consumption and in compliance with the European standard RoHS (Directive 2002/95/CE) or any equivalent standard …" Request for proposal N°04/2011/MEF/AC/INF, p29

"… The competitor is obliged to offer equipments that meet international environmental standards. Such equipments should be in compliance with the standard energy-saving "Energy Star" and with the European standard RoHS (Directive 2002/95/CE)…" Request for proposal N°7/2011/MEF/AC/INF, p4

References

[1] Lamb, J., *The grenning of IT: how companies can make a difference for the environment*. 2009, Boston: Pearson plc.

[2] L Webber, a., *Green tech: how to plan and implement sustainable IT solutions*. 2009, Newyork: Amacom.

[3] Nunn, S., *Green IT: Beyond the data centre how IT can contribute to the environmental agenda across and beyond the business*. 2007, Accenture.

[4] Gartner, *Going Green: The CIO's Role in Enterprise wide Environmental Sustainability*. 2008, Gartner research.

[5] EPA. *Report to Congress on Server and Data Center Energy Efficiency Public law 109-431*. 2007 ; A vailable from: http://www.energystar.gov.

[6] Gartner. *Gartner Estimates ICT Industry Accounts for 2 Percent of Global CO2 Emissions*. 2 007 ; A vailable from: http://www.gartner.com/it/page.jsp?id=503867

[7] Velte, T., A. Velte, and R. Elsenpeter, *Green-IT: reduce your information system's environmental impact while adding to the bottom line*. 2008: McGraw-Hill Companies.

[8] MCC, *Electronics Industry Environmental Roadmap*. 1996, Microelectronics and Computer Technology Corporation: USA. p. Appendix I - Composition of Typical Desktop Computer System.

[9] UNEP. *Urgent Need to Prepare Developing Countries for Surge in E-Wastes*. 201 0 ; Available from: http://www.unep.org/Documents.Multilingual/Default.asp?DocumentID=612&ArticleID=6471.

[10] EU. *Code of Conduct on Data Centres Energy Efficiency version 1.0*. 2008 ; Available from: http://re.jrc.ec.europa.eu/energyefficiency/

[11] TheGreenGrid. *About the Green Grid*. 2010 ; Available from: http://www.thegreengrid.org/about-the-green-grid

[12] Mines, C., E. Brown, and E.V. Metre, *Tapping buyers' growing interest in Green-IT*, . 2007, Forrester research.

[13] Gartner. *Top 10 strategic technologies*. 2010 ; Available from: www.gartner.com

[14] ClimateSaversComputing. *Mission: possible* 2010; Available from: www.climatesaverscomputing.org.

[15] Greenpeace. *Cool IT Challenge* 2010 ; Available from: http://www.greenpeace.org/international/en/campaigns/climate-change/cool-it/

[16] Escherich, M. and C. Smulders, *Dataquest Insight: Emerging Markets Are Becoming Dumping Grounds for Secondary PCs*. 2009, Gartner.

[17] Sander, K. and S. Schilling, *Transboundary shipment of waste electrical and electronic equipment /electronic scrap – Optimization of material flows and control*. 2010, Federal Environment Agency: Germany.

[18] Luther, L., *Managing Electronic Waste: Issues with Exporting E-Waste*. 2009, Congressional Research Service: USA.

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