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## **Suggesting a practical agenda for Green IS - recent solutions within a framework of efficiency, information, and effectiveness**

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## Suggesting a practical agenda for Green IS - recent solutions within a framework of efficiency, information, and effectiveness

### Abstract

Awareness of environmental sustainability and ecological issues is growing, and different industry sectors are seeking ways to address them effectively. The Information Systems (IS) community is in a position to make a significant contribution to environmental efforts, not only by mitigating its own impact, but also by guiding the activities of other communities. To support environmental efforts, or to become more —Green||, several Green fields and research streams have emerged. Previous Green IT research focused on mitigating and reducing the impact of IT production and manufacturing, whereas Green IS research has the ability to re-design modern activities to support environmental efforts. This abstract reviews the state-of-the-art of Green IS research, and lists categories of IS solutions for environmental issues. A major contribution of this abstract is a suggested research agenda for Green IS.

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# SUGGESTING A PRACTICAL AGENDA FOR GREEN IS – RECENT SOLUTIONS WITHIN A FRAMEWORK OF EFFICIENCY, INFORMATION, AND EFFECTIVENESS

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**Keywords:** Green IT, Green IS, Research Agenda

## INTRODUCTION

Awareness of environmental sustainability and ecological issues is growing, and different industry sectors are seeking ways to address them effectively. The Information Systems (IS) community is in a position to make a significant contribution to environmental efforts, not only by mitigating its own impact, but also by guiding the activities of other communities. To support environmental efforts, or to become more “Green”, several Green fields and research streams have emerged. Previous Green IT research focused on mitigating and reducing the impact of IT production and manufacturing, whereas Green IS research has the ability to re-design modern activities to support environmental efforts. This abstract reviews the state-of-the-art of Green IS research, and lists categories of IS solutions for environmental issues. A major contribution of this abstract is a suggested research agenda for Green IS.

### Definitions of Green IT and Green IS

The definitions of IT and IS vary, however it commonly accepted that IT includes hardware, software, data and telecommunication, whereas IS includes, in addition to these components, people and processes (Bernus & Schmidt, 2006). Green IT and Green IS build on these definitions, when Green IT focuses on mitigating the negative environmental impact created by production, usage, and disposal of IT components (i.e., software, hardware, and data/telecommunication).

In contrast, Green IS includes the impact of people and processes. It therefore has a greater potential to influence Green themes. The field does not only aim to mitigate the negative effects of IT operations, but seeks to create positive influences on the environment among non IS or IT communities (Boudreau, Chen, & Huber, 2008). Green IS focuses on “the design and implementation of information systems that contribute to sustainability of business processes” tackling a much larger problem, and seeking to add value, rather than only mitigate harm. In other words, while Green IT focuses on becoming more “eco-efficient”, that is, to reduce the negative environmental effects of IT operations, Green IS aims for “eco-effectiveness”: to create and support opportunities for mitigating negative environmental effects of other operations, with the use of IS (Watson, Boudreau, Chen, & Sepúlveda, 2010).

### Green IT research

Green IT research provides insight into its antecedents and outcomes. Antecedents were studies in the form of motives driving Green IT initiatives. Three groups of motives have been identified:

- (1) Economic and competitive - including cutting costs (Sayeed & Gill, 2008) and addressing consumer demand (Elliot & Binney, 2008)
- (2) Legal (Elliot, 2007) - including government reporting and regulation (Elliot & Binney, 2008)
- (3) Social responsibility (Kuo & Dick, 2010) - including ethical drivers (Molla, 2008)

Different cultures emphasize different drivers: while US organizations are driven by economic considerations, ethical considerations are the primary drivers of organizations in Australia and New Zealand (Molla, Pittayachawan, & Corbitt, 2009).

Consequences of Green IT have been studied aiming to measure the impact of Green IT on economic aspects of organizational systems (Velte, Velte, & Elsenpeter, 2008), e-business (Yi & Thomas, 2006) and across the supply chain (Rao & Holt, 2005). There is a debate as per the negative and positive impact of Green IT initiatives on the environment (Köhler & Erdmann, 2004) (Berkhout & Hertin, 2004), and on organizational outcomes (Fuchs, 2008).

The drivers and the consequences of Green IT need to be taken into account when Green IS initiatives are designed, as they are likely to apply to these initiatives as well.

## **GREEN IS RESEARCH**

Recent IS research has been concerned with identifying further questions to be studied in order to define the IS environmental agenda (Melville, 2010). In addition, Green IS research seeks to provide practical suggestions for supporting environmental sustainability. We categorize these practical suggestions according to the framework of Chen et al. (2008), into three categories:

- (1) Eco-efficiency efforts, which involve automation of existing functions
- (2) Eco-equity efforts, directed at information flow
- (3) Eco-effectiveness efforts, which transform organizations and societies.

Major practical suggestions are elaborated further in the abstract. All suggestions are summarized in Table 1.

### **Eco-efficiency**

Automation of existing functions using IT has been suggested as a way IS can support environmental efforts. This includes using ICT to replace paper, and virtualization of meetings and collaborative technologies.

#### **Really Going Paperless**

Despite the decades-old promise of the paperless office, ICT has greatly increased our use of paper in many areas (Sellen & Harper, 2002). Despite the popularity of e-business, online surveys, document readers, tracking facilities in word processors, e-books, online news, digital archiving, photo display devices and so on, research is still needed into increasing utility, usability and user acceptance of e-tools.

#### **ICT-enabled conferencing and collaborating**

Human interactions are necessary for the effective performance of human enterprises. Traditionally, face-to-face interactions have been preferred, requiring people physically arrive at work venues. Despite research showing the benefits and effectiveness of ICT solutions (see for example Hasan, 2005; Hasan & Crawford, 2007), the uptake of these ICT solutions is not sufficiently widespread. To encourage greater use of ICT tools, further research is needed to improve aspects like usability, effectiveness, and acceptance.

**Table 1 Three aspects of Green IS**

Aspect	Proposed Action	Proposed Research
<b>Eco-Efficiency:</b> <ul style="list-style-type: none"> <li>Using IT to automate existing functions</li> </ul>	<ul style="list-style-type: none"> <li>Going paperless (Hasan, Ghose, &amp; Spedding, 2009)</li> </ul>	<ul style="list-style-type: none"> <li>Increasing utility, usability and user acceptance of e-tools</li> </ul>
	<ul style="list-style-type: none"> <li>Virtualization of meetings and collaborative technologies (Dwyer &amp; Hasan, 2010; Hasan et al., 2009)</li> </ul>	<ul style="list-style-type: none"> <li>Further understanding the relationship between social issues and technology.</li> </ul>
<b>Eco-Information:</b> <ul style="list-style-type: none"> <li>Providing information to consumers and businesses about the ecological impact of various activities</li> <li>Disseminating information as a mobilizing force to influence decisions and policy makers</li> </ul>	<ul style="list-style-type: none"> <li>Network-centric advocacy (Hasan et al., 2009)</li> </ul>	<ul style="list-style-type: none"> <li>The process of transitioning into network centrality</li> <li>The social effects of network centrality</li> </ul>
	<ul style="list-style-type: none"> <li>Providing information for consumers and companies on environmental impact (Hasan et al., 2009; Watson, Boudreau, &amp; Chen, 2010)</li> </ul>	<ul style="list-style-type: none"> <li>Identifying effective information</li> <li>Identifying effective methods of information provision</li> </ul>
	<ul style="list-style-type: none"> <li>Guidelines for ICT procurement/purchasing (Dwyer &amp; Hasan, 2010)</li> </ul>	<ul style="list-style-type: none"> <li>Measuring environmental impact of ICT equipment and usage</li> </ul>
<b>Eco-Effectiveness:</b> <ul style="list-style-type: none"> <li>Creating positive impact by radically changing current, unsustainable behaviors</li> </ul>	<ul style="list-style-type: none"> <li>4U framework for IS design (Watson, Boudreau, Chen, &amp; Sepúlveda, 2010)</li> </ul>	<ul style="list-style-type: none"> <li>Applying the 4U principles to non-transportation fields</li> </ul>
	<ul style="list-style-type: none"> <li>Simulation modeling for sustainable enterprises (Hasan et al., 2009)</li> </ul>	<ul style="list-style-type: none"> <li>Development of simulation models to reduce pollution while supporting business financials</li> </ul>
	<ul style="list-style-type: none"> <li>Optimizations (Ghose &amp; Koliadis, 2007; Harvey, Chang, &amp; Ghose, 2006; Hasan et al., 2009)</li> </ul>	<ul style="list-style-type: none"> <li>Developing optimization tools to reduce pollution while supporting business financials</li> </ul>
	<ul style="list-style-type: none"> <li>Enhancement of holistic business processes (Dwyer &amp; Hasan, 2010)</li> </ul>	<ul style="list-style-type: none"> <li>Cultivating holistic views among business and IS graduates</li> </ul>

### **Eco-Information**

Eco-information is two-fold: on one hand, providing information to consumers and businesses about the ecological impact of various activities. On the other hand, eco-information efforts disseminate information as a mobilizing force to influence decisions and policy makers.

Informing individuals, groups, and organizations

Relatively simple IS tools (i.e., check lists, fact sheets, carbon calculators, and product labeling) (Watson, Boudreau, & Chen, 2010) can support individuals motivated to contribute to environmental sustainability. These tools are also good informants for organizations, groups, and governments driven by ethical considerations (Elliot, 2011). This is a low-cost way (albeit trivial) to empower individuals to be greener not only at home but also in small businesses and work units.

Research into what effective information is needed, as well as what methods of information provision are effective is required.

#### Network-Centric Advocacy and Government Policy

Supported by Web 2.0, the balance of power with respect to knowledge is now shifting from the 'official versions' in the hands of governments, big business, media moguls, formal libraries and publishing houses. Now, if anyone wants to 'know' they are more likely to go to Google or Wikipedia. This has democratized knowledge and provided a form of network-centric advocacy which is changing the political landscape. This phenomenon can be used to support the environmental movement, by leading changes in social norms with respect to environmental issues. The "marketing" of these issues using social media has shown effective in areas such as public health for almost a decade (Donovan & Henley, 2003), and can thus be harnessed for environmental issues. Transitioning into network centrality, and the effects of it are themes that need further research.

#### Eco-effectiveness

Going beyond reducing the negative impact of current activities on the environment, achieved by eco-efficiency, is the creation of positive impact by radically changing current, unsustainable behaviors. These radical changes are grouped as eco-effectiveness efforts to support the environment (Elliot, 2011). They include the 4U framework for IS design, optimization, the enhancement of holistic business processes, and systems for optimizing IT quality.

#### The 4U framework for IS design

Information systems developed based on four principles: ubiquity, uniqueness, universality, and unison, have been shown more effective for environmental efforts in transportation systems (Watson, Boudreau, Chen et al., 2010). Further research is required to the application of these principles to other arenas.

#### Computer-based simulation models

Building on the economic drivers of companies adopting green issues, companies with large carbon-footprint can be encouraged to support the environment through the use of computer-based simulations. These simulation models can demonstrate that environmental issues, such as reducing waste from the production stream, are closely associated with the production and economic aspects of the product, such as reducing costs. Simulation tools effectively demonstrate how environmental sustainability saves costs in the long run (see for example Hsien, Spedding, Bainbridge, & Taplin, 2006; Taplin, Spedding, & Khoo, 2006).

#### Optimization Information Systems

Optimizations of design and operational efficiencies have been shown to apply to climate change solutions (Ghose & Koliadis, 2007; Harvey et al., 2006). These optimizations utilize techniques which have significantly improved warehousing and manufacturing layouts, production and logistics schedules, and also highway networks and urban layouts.

Catering for limited organizational budget, Supply Chain Optimization Audit (SCOA) methodology under development (Hasan et al., 2009) helps organization identify optimal opportunities for carbon footprint reduction, which offer the best 'green return' on effort.

## CONCLUSION

This abstract examines Green IS research to date. It provides a definition of Green IS, which is distinguishable from Green IT, and highlights the extensive role IS can play in supporting environmental efforts. After reviewing current Green IT and Green IS literature, the abstract categorized Green IS efforts into three main categories: eco-efficiency, eco-information, and eco-effectiveness (Chen et al., 2008). Within this framework, the abstract categorizes practical suggestions recently proposed in Green IS literature, and respective research agenda. The breadth of these suggestions suggests that IS researchers and practitioners can play an important role in environmental efforts, by applying their expertise to a wide range of disciplines.

## REFERENCES

- Berkhout, F., & Hertin, J. (2004). De-materialising and re-materialising: digital technologies and the environment. *Futures*, 36(8), 903-920.
- Bernus, P., & Schmidt, G. (2006). Architectures of information systems. *Handbook on Architectures of Information Systems*, 1-9.
- Boudreau, M. C., Chen, A., & Huber, M. (2008). Green IS: Building sustainable business practices. *Information Systems: A Global Text*. Available from <http://globaltext.terry.uga.edu/node/21>.
- Chen, A. J. W., Boudreau, M. C., & Watson, R. T. (2008). Information systems and ecological sustainability. *Journal of Systems and Information Technology*, 10(3), 186-201.
- Donovan, R. J., & Henley, N. (2003). *Social marketing: principles and practice*: IP Communications, Melbourne.
- Dwyer, C., & Hasan, H. (2010). Emergent Solutions for Global Climate Change: Lessons from Green IS Research. *The International Journal of Social and Organizational Dynamics in Information Technology*, forthcoming.
- Elliot, S. (2007). *Environmentally sustainable ICT: a critical topic for IS research?* Paper presented at the PACIS 2007, Auckland, New Zealand.
- Elliot, S. (2011). Transdisciplinary Perspectives on Environmental Sustainability: A Resource Base and Framework for IT-Enabled Business Transformation.
- Elliot, S., & Binney, D. (2008). *Environmentally Sustainable ICT: Developing Corporate Capabilities and an Industry-Relevant IS Research Agenda*. Paper presented at the PACIS 2008, Suzhou China.
- Fuchs, C. (2008). The implications of new information and communication technologies for sustainability. *Environment, Development and Sustainability*, 10(3), 291-309.
- Ghose, A., & Koliadis, G. (2007). Actor eco-systems: From high-level agent models to executable processes via semantic annotations.
- Harvey, P., Chang, C., & Ghose, A. (2006). Support-based distributed search: A new approach for multi-agent constraint processing. *Argumentation in Multi-Agent Systems*, N. Maudet, S. Parsons and I. Rahwan. *Springer Lecture Notes in AI*, 4766.
- Hasan, H. (2005). Socio-Technical Systems: from individual transaction to situated community activity. *Activity as the Focus of Information Systems Research*, Knowledge Creation Press, UCQ, 29-46.
- Hasan, H., & Crawford, K. (2007). Knowledge Mobilisation in Communities through Socio-Technical System. *Journal of Knowledge Management Research and Practice*, 5(4), 237-248.
- Hasan, H., Ghose, A., & Spedding, T. (2009). *IS Solution for the Global Environmental Challenge: An Australian Initiative*.
- Hsien, H., Spedding, T., Bainbridge, I., & Taplin, D. (2006). Creating A Green Supply Chain: A Simulation and Modelling Approach. *Greening the Supply Chain*, 341-361.

- Köhler, A., & Erdmann, L. (2004). Expected environmental impacts of pervasive computing. *Human and Ecological Risk Assessment: An International Journal*, 10(5), 831-852.
- Kuo, B., & Dick, G. (2010). The greening of organisational IT: what makes a difference? *Australasian Journal of Information Systems*, 16(2).
- Melville, N. P. (2010). Information systems innovation for environmental sustainability. *Management information systems quarterly* 34(1), 1-21.
- Molla, A. (2008). *GITAM: A Model for the Adoption of Green IT*. Paper presented at the ACIS 2008 Proceedings.
- Molla, A., Pittayachawan, S., & Corbitt, B. (2009). *Green IT diffusion: An international comparison*: Green IT Observatory, RMIT School of Business IT and Logisticso. Document Number)
- Rao, P., & Holt, D. (2005). Do green supply chains lead to competitiveness and economic performance? *International Journal of Operations & Production Management*, 25(9), 898-916.
- Sayeed, L., & Gill, S. (2008). An exploratory study on environmental sustainability and IT use.
- Sellen, A. J., & Harper, R. H. R. (2002). *The myth of the paperless office*: Citeseer.
- Taplin, D. M. R., Spedding, T. A., & Khoo, H. H. (2006). Use of simulation and modelling to develop a sustainable production system. *Sustainable Development*, 14(3), 149-161.
- Velte, T., Velte, A., & Elsenpeter, R. C. (2008). *Green IT: reduce your information system's environmental impact while adding to the bottom line*: McGraw-Hill Osborne Media.
- Watson, R. T., Boudreau, M. C., & Chen, A. J. (2010). Information systems and environmentally sustainable development: energy informatics and new directions for the IS community. *MIS Quarterly*, 34(1), 23-38.
- Watson, R. T., Boudreau, M. C., Chen, A. J., & Sepúlveda, H. H. (2010). Green projects: An information drives analysis of four cases. *The Journal of Strategic Information Systems*.
- Yi, L., & Thomas, H. R. (2006). E-business and Sustainable Development. *International journal of environment and sustainable development*, 5(3), 262-274.