Spring 5-19-2016

Environmental Management Information Systems: A Conceptual Overview and Review of Vendors

Jeffrey W. Merhout
Miami University, jmerhout@miamioh.edu

Mary M. Callison
Wright State University, mary.callison@wright.edu

Shu Schiller
Wright State University, shu.schiller@wright.edu

Follow this and additional works at: http://aisel.aisnet.org/mwais2016

Environmental Management Information Systems: A Conceptual Overview and Review of Vendors

Jeffrey W. Merhout
Miami University
jmerhout@miamioh.edu

Mary M. Callison
Wright State University
mary.callison@wright.edu

Shu Schiller
Wright State University
shu.schiller@wright.edu

ABSTRACT

Organizations need relevant and specific information systems to operate their carbon emissions, energy use, and other green activities to support its management of sustainability initiatives and related accounting and other reporting requirements. Green information systems (IS) and environmental management information systems (EMIS) thus become necessary for monitoring and controlling activities and procedures regarding environmental concerns. In the IS scholarly community, we have not yet given full attention to carbon management and environmental management IS, despite our increasing efforts in research around green information systems. In this paper, we aim to introduce the concepts of environmental management information systems by discussing some of their common software characteristics, such as whether support for ISO 14001 is provided. We provide an overview of a collection of such green and sustainable information systems and will discuss thoughts on directions for conducting IS research on these topics at the conference.

Keywords:

Environmental management information systems, sustainability, green IS, carbon accounting and reporting

INTRODUCTION

As societies and organizations struggle to get a handle on environmental stewardship, the information systems (IS) research community has a golden opportunity to make difference. This is exactly the reason that the AIS Special Interest Group on Sustainability (SIGGreen) was established – information is a significant resource for entities to use to manage sustainable development activities. Indeed as key resources (e.g., energy, land, water) have become increasingly limited over the last several decades, data and information about these resources has become more available (Baya and Gruman, 2011) and rather inexpensive too. Thus our research community is in a position to help guide sustainability efforts. The purpose of this work-in-progress paper is to introduce green information systems and environmental management IS (EMIS) that are already available (and rapidly continuing to develop) to support these important organizational initiatives.

One motivation for our research is to understand the nature and characteristics of the emerging environmental management information systems. These EMIS are in the nascent stages of development and are comparable to enterprise systems in the mid-to-late 1990s. At that time, we knew those enterprise systems were developing quickly and would have a big impact in IT strategy and on organizational processes, but we did not know much about them and were unaware of the key research issues. Slowly over time, the literature developed and enterprise systems research has led to a substantive understanding by the academic community, and now all IS core class textbooks include a significant discussion of these systems. Accordingly, in attempt to gain a working understanding of EMIS, we collected a list of green and sustainable information systems and provide an overview on their features, characteristics, strengths and weaknesses. This portion of our research is in its beginning stages and will be more thoroughly developed for discussion at the conference in May.

ENVIRONMENTAL MANAGEMENT SYSTEMS

In order for any organization to successfully manage their carbon footprint and the complexity of carbon accounting and reporting, some sort of formal structure will be needed. The International Organization for Standardization (ISO) has created a framework for organizational environmental management systems (EMS) called the ISO 14001 series which addresses requirements for quality organizational environmental management and its associated management framework and provides

general guidelines for EMS (http://www.iso.org/iso/home/standards/management-standards/iso14000.htm). Speshock (2010, p. 103) describes EMS as a "set of management tools and principles designed to create administrative procedures that a company needs to integrate environmental concerns into its daily business practices." Cummings (2009, p. 229) adds that in order "for sustainability accounting/reporting to be effective, it must be supported by an EMS." Hence it seems logical that one of the tools necessary for carbon accounting (and other environmental management practices) is a quality information system, with quality being characterized by features available that support the ISO 14001 series. For the purposes of this paper we plan to analyze various EMIS to see if the ISO 14001 guidelines are addressed. Moreover, we note that carbon management, accounting, and reporting systems (which appear to be a precursor to many current EMIS) are a logical subset of EMS and contend that these systems can also be classified as green information systems.

GREEN/SUSTAINABLE INFORMATION SYSTEMS AND EMIS

Green information systems are defined by Watson, Boudreau, Chen, and Huber (2009, p. 2) as "the design and implementation of information systems that contribute to sustainable business processes." Based on this classic, broad description, we conceptualize EMIS (the term we choose to refer to at this stage of our research) to be a subset of green IS. El-Gayer and Fritz (2006, p. 756) provide an insightful and thought-provoking overview of EMS and define EMIS as "organizational-technical systems for systematically obtaining, processing, and making available relevant environmental information available in companies." Specifically these systems attempt to automate environmental management activities, incorporate lifecycle assessments and environmental cost accounting, and meet compliance reporting requirements. In our research, we identified several types (and names, some of which overlap) of information systems that generally fit El-Gayer and Fritz's description of EMIS, including: environmental, social, and economic life-cycle modeling software, such as the WorleyParsons EcoNomics DELTA tool set (Hardisty, 2010); carbon emissions management software (Philipson, Foster and Brand, 2009; Unhelkar, 2011); carbon management systems (Corbett, 2013); enterprise sustainability planning (ESP) systems (Kelly, Ashton and Baya, 2011); enterprise carbon accounting (ECA) software (Groom, 2010); and emissions tracking and energy management software (Deloitte, 2007).

For purpose of this paper, we only discuss systems that appear to be comprehensive enough to support sustainability initiatives and reporting requirements. Indeed, we identified the commonly used EMIS we cover in Table 1 in the Appendix from a review of Fortune 50 company sustainability reports. In our continuing research, we plan to investigate these EMIS to identify consistent features included in the systems in addition to analyzing how these EMIS compare to general benchmark features of quality software (per ISO 25010:2011), such as reliability, usability and efficiency. In addition, we hope to be able to visit an organization using one of these commonly used EMIS to obtain more information about the features that the organization does indeed use and analyze what might make such software even more useful. We may also be able to determine some of the challenges faced and lessons learned as the organization adopted the system.

CONCLUSION

Quality organizational environmental management requires appropriate tools, such as information systems designed to support operational and reporting requirements. Our research-in-progress explores environmental management information systems and some of the common, important features such IS can provide. We look forward to presenting the results of our review of selected systems at the conference.

REFERENCES

Baya, V., and Gruman, G. (2011), "Sustainability: Moving from compliance to leadership," *PwC Technology Forecast 2011*, Issue 4, pp. 7-21.

Corbett, J. (2013), "Designing and Using Carbon Management Systems to Promote Ecologically Responsible Behaviors," *Journal of the Association for Information Systems*, Vol. 14, Issue 7, pp. 339-378.

Cummings, L. (2009), "Sustainability Accounting and Reporting," Chapter 12 in Staib, Robert (ed.), *Business Management and Environmental Stewardship: Environmental Thinking as a Prelude to Management Action*, Palgrave Macmillan, London, pp. 226-252.

Deloitte Consulting LLP (2007), Green IT: The Fast-track to Enterprise Sustainability, available at http://www.deloitte.com/view/en_US/us/Services/additional-services/sustainability-climate-change/ff962e45b72fb110VgnVCM100000ba42f00aRCRD.htm

El-Gayar, O. and Fritz, B. (2006), "Environmental Management Information Systems (EMIS) for Sustainable Development: A Conceptual Overview," *Communications of the Association for Information Systems*: Vol. 17, Article 34. Available at: http://aisel.aisnet.org/cais/vol17/iss1/34

Groom Energy Solutions (2010), "Enterprise Carbon Accounting: an Analysis of Corporate-Level Greenhouse Gas (GHG) Emission Reporting," Available at http://www.groomenergy.com/files/ECA_Jan11_update_sample_free_excerpt.pdf

Hardisty, P. (2010), *Environmental and Economic Sustainability*, CRC Press, Boca Raton, FL.

Kelly, D., Ashton, H. and Baya, V. (2011), "Closing the loop on sustainability information," *PwC Technology Forecast 2011*, Issue 4, pp. 33-47.

Philipson, G., Foster, P. and Brand, J. (2009), "Carbon Emission Management Software (CEMS): A New Global Industry," Chapter 30 in *Handbook of Research in Green ICT: Technical, Business and Social Perspectives,* ICI Global, Hershey, PA.

Speshock, C. (2010), *Empowering Green Initiatives with IT: A Strategy and Implementation Guide*, John Wiley & Sons, Inc., Hoboken, NJ.

Unhelkar, B. (2011), *Green IT Strategies and Applications: Using Environmental Intelligence*, CRC Press, Boca Raton, FL.

Watson, R., Boudreau, M., Chen, A. and Huber, M. (2009), Green IS: Building Sustainable Business Practices, Global Text Project, 1-17, http://globaltext.terry.uga.edu/userfiles/pdf/Green.pdf

Appendix: Table 1 – Sample of EMIS vendors providing environmental management software used by Fortune 50 corporations.

Company Name	Website	Name of Product/System	*GRI Certified?	**ISO 14001	Real-time Dashboards	Some Clients	***Security
Dakota Software	www.dakotasoft.com	ProActivity™ Suite	DNA	Yes	Yes	Shell, Texas A&M, eBay, ADM, BP	Yes
	Features: Dakota Software offers four Management Systems modules that contain the full text of widely-accepted standards and associated checklist questions for analyzing the performance of EHS Management Systems. GHG Emissions module is a tool for building, assessing, maintaining, and improving systems for managing greenhouse (GHG) emissions.						
Ecosion	http://ecocion.com/main.html	Asset and Compliance Tracking System (ACTS)	DNA	DNA	Yes	Chaparral Energy, Oasis Petroleum, Kinder Morgan	Yes
	Features: Leading oil and gas companies have turned to ACTS to comply with the EPA GHG Mandatory Reporting Rule for production, pipeline and LDC facilities. ACTS allows companies to take control of all EHS requirements, air emission tracking, sustainability and governance needs from a single platform, thus reducing the cost of compliance activities and mitigating compliance risk.						
Intelex	www.intelex.com	Intelex Environment Solutions	Yes	Yes	Yes	Subaru, Bayer, RIT, Campbell's	Yes
	Features: Capture, track, report and act on every aspect of environmental programs and initiatives in real-time. Ensure full compliance with regulatory and voluntary standards such as ISO 14001, Global Reporting Initiative, Carbon Disclosure Project and more.						
Process MAP	www.processmap.com	Suite of Environmental, Health, & Safety (EHS) software solutions.	Yes	Yes	Yes	Cardinal Health, Goodyear, Harley-Davidson, Ryder	Yes
	Features: ProcessMAP offers an integrated suite of EHS software solutions to empower organizations to streamline Environmental, Health, and Safety (EHS) related processes and manage associated risks. The solution helps streamline collection, verification, analysis, and reporting of company-wide sustainability performance indicators (KPIs) in areas of environmental, social, safety, energy, and carbon tracking.						

DNA - does not appear to address this feature

* The Global Reporting Initiative (GRI) Certified Software Program confirms that GRI content is included (and being used correctly) in the software being sold

** Provides support for ISO 14001 series standard for environmental management systems

*** Vendor claims that security features are built into the software