

Information Systems for Sustainable Organizations

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Abstract. Nowadays sustainability is a broad and complex concept, which should be applied to any significant economic activity. Sustainable development involves environmental, economic and social aspects of long-term local and global processes implying an overall progress. Various contradicting requests arise which organizations should resolve in their projects and the proper information support becomes a key factor for this. In the context of the above, the goal of this paper is to examine how information systems within the organization contribute for sustainable development by providing appropriate information services. The monitoring and reporting of the organisational impact on sustainability is constantly required both by members and business partners. Thus, sustainability can be viewed as a new dimension of information system assessment.

Keywords. information systems, organizational sustainability

1. Introduction

Recently information systems have become an important managerial tool that helps organizations to operate in a global economy. From a business perspective, an information system provides a solution to a problem or challenge facing a firm and provides real economic value to the business. Organizations are trying to become more competitive and efficient by transforming themselves into digital firms where nearly all core business processes and relationships with customers, suppliers, and employees are digitally enabled.

There are several definitions of the notion of sustainability. The UN definition states that sustainability is “doing what is required to meet the needs of the present without compromising the ability of future generations to meet their own needs.” Generally speaking, this means that driving innovations are supposed to protect the environment, human and ecological health without compromise the way of life. Sustainability is based on a simple principle: Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. Being engaged in sustainability assumes to create and maintain the conditions under which humans and nature can exist in productive harmony to support present and future generations [1]. Sustainable development involves environmental, economic and social aspects of long-term local and global processes implying an overall progress – the Brundtland Report [2].

In the context of the above the goal of this paper is to examine how information systems within the organization contribute for a sustainable development by providing appropriate information services. We try to evaluate the degree to which companies' information systems correspond to needs determined by the objectives of sustainability. Analyzing information systems enabled organizational practices and processes that improve

organizational economic performance the relationship between sustainability and information system will be investigated.

2. Research background and Literature Review

Information systems consist of a series of value-adding activities for acquiring, transforming, and distributing information to improve management decision making, enhance organizational performance and, ultimately, increase firm profitability. Businesses today use information systems to achieve:

- operational excellence;
- new products and services;
- improved decision making;
- real economic value to the business.

An information system represents a combination of management, organization, and technology elements. The management dimension of information systems involves leadership, strategy, and management behavior. The technology dimension consists of computer hardware, software, data management technology, and networking/telecommunications technology (including the Internet). The organization dimension of information systems involves the organization's hierarchy, functional specialties, business processes, culture, and political interest groups.

Sustainability is based upon three components: economic growth, social progress and environmental protection. It consists of three different dimensions: economic, environmental, and social. The economy is a subsystem of the human society that itself is part of the environment. So the environmental dimension concerns the human behavior and its impact on the nature thus representing the most important aspect of sustainability.

Organizational sustainability concerns the ability to achieve organizational goals and increase long-term member and business partners' value by integrating economic, environmental and social opportunities into organizational strategies. Companies can integrate sustainability in their daily business operation along the following primary dimensions [3]:

- strategy -ensure realistic vision and goals for the organization;
- product/services – confirm high quality deliverables;
- human resources – make certain a reliable and efficient performance of the personnel;
- finances – conduct financial reserve and contingency planning.

The conformance of sustainability terms to internal organizational terms is shown on Fig.1 [4]:

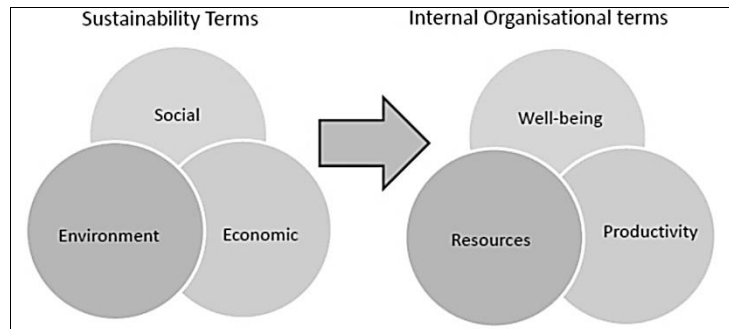


Fig.1 (Copyright David Alman 2011)

Well-being concerns employees' satisfaction and health. Resources covers energy and material uses, i.e. their sustainable consumption. Productivity reflects the value of product/services and deals with their optimization as outcomes of the business.

Nevertheless that information system is important for the sustainable development of any business organization the relationship between sustainability and information system is subject to a limited academic research. The three sustainability aspects in relation to information systems have been investigated in [5]. Criteria of sustainable information system which could be used as a pattern for comparing information systems regarding with the concept of sustainability and a proper structure – a sustainable target cube - have been proposed [6]. The role of information systems to achieve sustainability in business processes has been evaluated by Caldelli and Parmigiani [7]. Chen [8] analyzed how information systems can help organizations develop ecological sustainability. Information systems are important in improving the economic performance and promoting sustainable processes and practices in the organization [9]. In response researchers have started to analyze the role of information systems and the way they contribute to the environmental sustainability [10]. The use of information systems to improve sustainability across the economy has been defined as “Green IS” [11]. This view comprises improving the efficiency in industries such as the transportation, manufacturing, and energy sectors that are major sources of toxic emissions. However the production and use of computers is a fast-growing component of global energy consumption because the increase in computing power leads to an increasing demand for electricity, cooling and space. So, “Green IT” describe: “... the study and practice of designing, manufacturing, using and disposing of computer, servers and associated subsystems ... efficiently and effectively with minimal or no impact on the environment.”[12]. Achieving environmental sustainability involves the attempts to reduce the environmental impacts of information technology production and use.

3. Green IS and Green IT: concepts and issues

Information Systems (IS) integrates Information Technology solutions and business processes to meet the information needs of businesses and other enterprises enabling them to meet their objectives in an effective and efficient way [13]. According to the business dictionary, an Information System is “a combination of hardware, software, infrastructure and trained personnel organized to facilitate planning, control, coordination and decision making in an organization.” Green IS refers to the design and implementation of information systems that contribute to sustainable business processes [11]. They encompass organizational practices and processes that improve environmental and economic performance. Green IS facilitate sustainability by the provision of accurate, timely, and useful information concerning the uses of different resources and their implication on organizational costs, savings, and earnings. There are different green IS practices:

- reducing business and production processes' consumption of resources by tracking resource flows, waste, and emissions to provide information for environmental control and sustainability-oriented decision-making;
- generating innovative end products and infrastructure solutions e.g. digital services instead of physical assets, engine control units traffic management systems etc.);
- reengineering of business and production processes that enhance (natural) resource efficiency.

We stick to the view that information technologies are a component of information systems thus focusing on hardware and software resources that facilitate information

activities within the organization. Green IT refers to environmentally sound IT that addresses energy consumption and waste associated with the use of hardware and software. Green IT allows for a better utilization of computing resources and comprises activities that decrease the negative environmental impact of the overall IT infrastructure. The main concerns are:

- resource requirements of the manufacturing hardware;
- electronic waste due to legacy IT equipment;
- power consumption of all devices operated by the organization.

Therefore Green IT practices concentrate on:

- achieving energy efficient IT operations within the organization;
- taking into account environmental criteria when acquiring hardware, software, and services;
- virtualization that permits to use fewer servers, thus decreasing electricity consumption and waste heat]
- applying environmentally friendly practices referring to the disposal of IT equipment (telecommuting, remote computer administration to reduce transportation emissions);
- using renewable energy sources to power data centers.

The difference between Green IS and Green IT consists in the way sustainability has been approached. Green IT addresses the question “How to reduce the impact of technologies on the environment” while Green IS refers to the development and use of information systems to enable environmental sustainability initiatives. The impacts of IT on the environment are ranked as follows [14]:

- 1st order: direct impacts concerning the physical existence of IT (environmental impacts of the production, use, recycling and disposal of hardware) during the product lifecycle;
- 2nd order: indirect environmental impacts of IT due to its power to change processes (such as industrial production or transportation), influencing their environmental characteristics;
- 3rd order: long-term and dynamic impacts concerning changes in lifestyles or economic structures because of the widespread use of IT e.g. telecommuting,.

Green IT denotes the first-order environmental effects of information systems (manufacturing, use, and disposal of IT equipment) while Green IS covers the second-order impacts (greening of business and production processes) and third-order impacts (reduced resource consumption, waste, and emissions during the lifecycle of end products and services). Green IT is a part of Green IS. Green IT measures refer to the operational and tactical management of IT departments. The basic functional structures of any organization include finance and accounting, engineering and design, marketing, human resource and manufacturing. Each of these functional structures is a consumer of IT. Analyses are to be performed so as to control how information systems provide the much needed solution to environmental pollution problem.

Green IS practices influence organizational core processes. Green IS contributes to the development of strategic organizational systems that allow for sustainable business measures. Green IT focuses on energy efficiency and utilization of equipment in organizations. Information systems are essentially related to information technologies because IT provides the infrastructure on which ISs are implemented. So, all concepts that apply to Green IT can be discussed as part of Green IS.

The scope of Green IT and Green IS are illustrated on Fig.2 [15]:

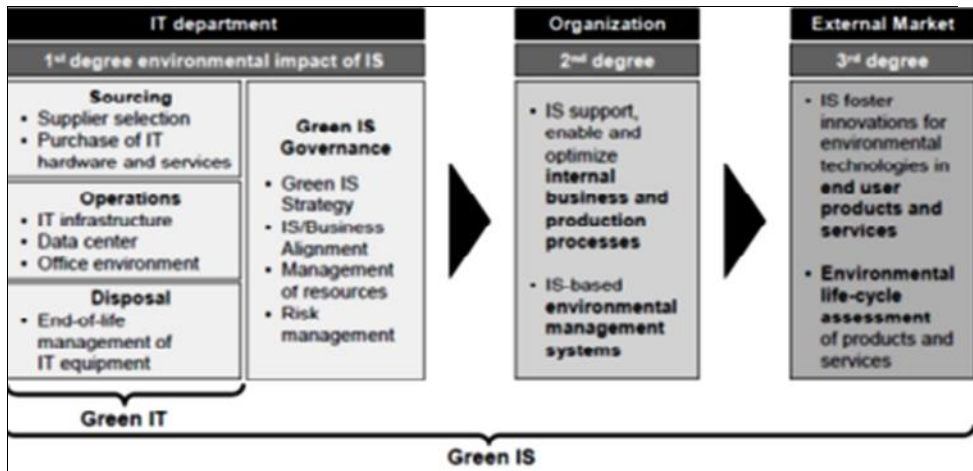


Fig.2 Scope of Green IT and Green IS

A considerable productivity improvement is a result of information systems. Currently, many organizations can achieve a sustainable development by improving productivity, reducing costs, and enhancing profitability. However due to bad environmental practices such as unused resources, energy inefficiency, and bad emissions they lose economic efficiency. That's why the different Green IS initiatives could improve the poor environmental practices. As sustainability appears to be a challenge of modern society and information is a valuable asset so, solutions could be proposed by information systems. A design theory concerning how to build information systems that allow organizations to perform environmentally sustainable work practices and make environmentally sustainable decisions is presented in [16].

4. Conclusion

In this paper we tried to examine how information systems within the organization contribute for sustainable development. Sustainable measures can be viewed as a necessity so as organizations to remain competitive in the future. As the field of Green IS and IT is a relatively new one, we followed a literature review strategy as a main method. A review of the Green IS and IT academic and practitioner literature as well as literature on the technical, social and process views of IS has been performed. This method is suitable to analyze the difference among the proper concepts. We tried to provide clear definitions of Green IT and Green IS based on the findings in the current academic literature and to delineate the basic differences concerning their scope. Green IS represents a new and promising research area that concerns with the use of information systems to provide good environmental practices. At the same time a significant number of frameworks for Green IT have been proposed versus models for Green IS. In our opinion more efforts have to be directed to Green IS in order to provide a background for their implementation within the organization.

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