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Eco-innovations characterized: a taxonomic classification of relationships between humans and nature

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ABSTRACT

Researchers in eco-innovations are increasingly concerned with building upon models that are focused upon the concept of nature and related issues of eco-effectiveness for the short and long-term welfare of society and nature, rather than building knowledge on models that are solely based on eco-efficiency, in the short-term in which it is assumed that nature exists for the convenience of man. The proposed change in perspective requires a shift from an anthropocentric to a more eco-centric approach. This shift challenges us to understand and to work with different types of relationships between humans and nature while building upon the basic principles of biology and thermodynamics of the eco-system. In this article, the authors propose a typology of eco-innovations, based on an analysis of historical developments of ideas and concepts pertaining to human and nature interactions. The authors consider nature to be of central importance and they appeal for a dialogical approach to nature in developing innovations that are appropriate from an ecological, social and economic perspectives.

1. Introduction

The authors of this article examined the origins of the concepts of eco-innovations from which the 'ecological-imperative,' within the innovation field has emerged. An extensive study of historical and recent literature was used as the basis for examining the different types of the relationships between humans and nature. The authors performed a conceptual exploration of the term eco-innovation in light of (changing) human–nature relationships; they documented that the dominant discourse in studies of eco-innovation have been predominantly anthropocentric. They not only took issue with the strong anthropocentric ideas in the field of eco-innovations, but also looked at eco-innovation if it were conceived of from an eco-centric perspective. They do not claim superiority of humans over nature, or for superiority of nature over man (Rousseau's sentiments) but appealed for an appropriate dialogue with nature within the field of eco-innovations. Eco-innovations, in their broader context, can consider inventions, designs and new solutions for fulfilling human's and nature's needs in ecologically effective ways.

The literature review revealed that there are many deeply rooted anthropocentric ideas within the concepts surrounding eco-innovations. "Even the Brundtland definition of sustainable development may have had a major role the anthropocentric view of eco-efficiency and eco-innovation".[2] Currently, it is rare when extended rights are granted to other species in the eco-system. Fortunately, progress is being made in using eco-centric concepts and designs, such as bio-mimicry and cradle-to-cradle approaches, which are more eco-centrically oriented.

From an economic perspective, it is clear that commercial applications are essential for innovational success. From ecological perspectives, objectives and targets to prevent or to reduce negative environmental and human health impacts are or will increasingly be prerequisites for companies to obtain or to retain their 'licenses-to-operate,' within societies that are striving to become sustainable. In international eco-politics, one such society is Ecuador. It is the first country that changed its constitution to proclaim that nature (organisms in the eco-system) have 'the right to the maintenance and regeneration of their vital cycles, structures, functions and evolutionary processes." (New York Times: 8th

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[2] Remark of one of the reviewers of this article.

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Annual Year in Ideas list, 2009). This application of principles of nature to societies was proposed to be termed, "an eco-mimetic development" by Nielsen (2006).

Within the research on eco-innovation, dissemination and diffusion are provided central roles, whereas, the stage of invention and design of new, ecologically sound ideas are inadequately addressed. Design-thinking and nature perspectives are seldom seriously considered. Eco-innovations are usually viewed as a blueprint for continuing the traditional anthropocentric innovation approaches. But new ideas and initiatives are rapidly entering the scene, entailing quite different methods and techniques to build upon the essentiality of working **with** the eco-system rather than **against** it!

Therefore, the central question of this paper is:

How can eco-innovations that result from using a more eco-centric rather than an anthropocentric approach, help society to live in a more ecologically sustainable manner?

The objectives of this paper are: a). To present a general discussion on a 'nature-view' of eco-innovations and b). To propose a taxonomic categorization of eco-innovations with the potential for assessing the relationships between humans and nature. The article is divided into the following sections:

Section 2 discusses the shifts in economic processes when ecological problems are taken into account;
Section 3, describes perspectives in the relationships between man and nature;
Section 4, addresses the need for a paradigm shift to look at eco-innovations and to embrace radically new approaches of viewing and valuing nature;
Section 5, focuses upon the current state of affairs in the eco-innovation literature;
Section 6, presents a taxonomic categorization with the potential for assessing the relationships between humans and nature with regard to eco-innovations;
Section 7, presents conclusions and recommendations for future work on this dynamic and challenging field.

2. The ecological imperative

The ecological imperative is to stay within the biophysical carrying capacity of the planet and to restore natural processes in the sense of assisting the recovery of an ecosystem that has been damaged, degraded and destroyed (Davis and Slobodkin, 2004; Walsh, 1993). Biophysical requirements are fundamental, irreducible conditions for the life-support system of our Earth. Our creativity to do this is limited by our deep-rooted beliefs, values, knowledge and technological structures as well as by changing economic-ecological conditions. Until recently, a small body of knowledge on nature has been developed. The ecological imperative of today is increasingly challenging product and process designers to envision, develop and implement changes that encompass:

- a change from profit thinking to value thinking;
- a change from exploitation to exploration;
- cooperation next to competition;
- and a shift to new resource allocation models (Hofstra, 2007).

Increased attentions to environmental issues and subsequently to the concept of sustainability have evolved since the middle of the 1900s. At the beginning, discussions on economic growth and sustainable development were mainly limited to debates between idealistic and realistic environmental scientists. The recent array of efforts to recover and restore balance between humans and nature were taken with measures to limit and/or to prevent environmental damages in the 1960's (Baas, 2005), however, already in the mid 19th century, environmental issues related to industrial production were debated and were acted upon from a regulatory approach. Today's reality is that nature has been and is being over-exploited to or beyond the eco-system's limits, in many parts of the world, by numerous firms, consumers and governments. The concept of sustainability, although it is accepted worldwide, the definition varies in scale and context of application; it can be seen that we are 'selling out to pragmatism' (Vos, 2007). That is why Vos distinguished between 'thin' and 'thick' versions of the concept, in which the 'thick' approach requires deeper transformations from our current ideas. Nature has numerous intrinsic values, whereas, from the economic imperative, nature is mainly identified as storage of raw materials for the human economy (Vos, 2007, p. 336).

Despite many technological developments, in recent decades, we still create and produce numerous exploitative innovations, even exploitative 'eco-innovations. One of the great challenges for today is to develop eco-innovations that are truly innovative in an ecological sense. Valuable knowledge on nature's lessons needs to be (re) introduced as eco-technological approaches. These new approaches can be low-tech solutions, often considered as primitive but they are often highly cost-efficient and eco-effective.

Eco-efficiency is serving the economic quality of being able to meet ecological issues and regulations successfully in the short term, without wasting time, costs and materials solely for the benefit of human beings. Eco-innovations should create eco-effective solutions for humans, which are simultaneously beneficial for maintaining or enhancing eco-system capacities to solve present and to prevent future ecological problems. Survival within a *sustainable market economy* will increasingly require firms to innovate, in order to perform better and differently than their competitors. Unfortunately, ecological successfulness (eco-effectiveness) is relatively unusual in fulfilling the requirement that the product is economically successful in the short-term (efficiency) and at the same time ecologically sound in both the short and long-term. To achieve this combination shifts from the deeply rooted, anthropocentric thinking are essential, already in the idea and design phases of the innovation process. In making this paradigm shift, nature can no longer be primarily viewed and used to serve human beings, but as a source of knowledge.

To build a sustainable future, we need a turning point in human ecological and ethical progress and a consequent shift to more eco-centric approaches. The shortcomings of purely anthropocentric approaches are, that nature is protected for the good of presently living humans, whereas, interests of future generations are not encompassed and an intrinsic value of nature is not acknowledged and nature has no legal rights (Emmenegger and Tschentscher, 1994).

Some illustrations of changes in that direction include the rise of bio-mimicry as a new discipline. Nature here is seen as model, measure and mentor. Within bio-mimicry or biomimetics, nature is studied and then imitated, judged and valued to get inspiration for product designs and processes to solve human problems. A solar cell for example is based on the design of a leaf (Beynus, 2002). The 'cradle-to-cradle' perspective (C2C) emphasizes the techno-sphere as well as the biosphere in the design stage of manufacturing and industrial processes. These ideas are based on systems based upon 'closing the loop,' often applied in architecture (McDonough and Braungart, 2002). The recent development of the idea of Turntoo products by Thomas Rau is questioning the ownership of products. For example a washing machine that is owned by the manufacturer, but the consumer can purchase the services of the machine for washing clothes. This means that the responsibilities and accountabilities for environmental burdens of the design and