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CHAPTER 29. Research Review: Magazines and Sustainability.

The pros and cons of paper (print) versus digital publications in relation to environmental sustainability have been summarized on the Green Technology weblog entry titled "Paper or Digital: Which Format is Better for the Environment," where a blogger who identified himself as Green Dude wrote:

> Main selling points . . . of eReaders is that they are greener than print. . . . [A] common view held by consumers . . . is that going digital means going green and saving trees. Many are in for a rude awakening. . . . [S]ubjected to "cradle-to-cradle" life-cycle analysis, eReading is not nearly as green as many naively assume it is. . . . Digital devices require a constant flow of electrons that predominately come from the combustion of coal, and at the end of their all-too-short useful lives electronics have become the single largest stream of toxic waste created by man.[1]

The blog post question reflects on the complexity of choice that sustainability-minded consumers ponder in relation to the transition from print to digital media.

The primary purpose of this chapter is to provide insights into the body of scholarly literature on the question of magazines and sustainability—in both production and editorial content. This chapter will also discuss production-side issues for business decision-making and policy, as well as editorial-side, within publishing organizations. Drawing on recent literature on the environmental impact of both information and communication technologies, with the Internet on the one hand and digitalization of media on the other, this chapter will identify a number of important effects of new magazine production and issues of sustainability with a primary focus on reviewing the emerging body of scholarly literature that relates to the question. The sociological and anthropological literature will be examined and Cradle to Cradle (C2C) theory

will be introduced, in order to lead to the discussion of research arising from these perspectives as well as methods being used to explore these questions.

The Problem

Digital technologies and products such as e-magazines are essential to the measurement, modeling, and communication of environmental processes, while also having a major role in improving the productivity of capital and natural resources. The optimization of processes through the digitalization of media has often benefited the environment because of improvements in resource efficiency, such as reducing the use of printed paper, but also because efficient processes tend to be relatively less polluting.[2] On the other hand, a prominent sociologist of globalization Saskia Sassen reflected, the "virtual economy" of digital products needs to be seen as intimately linked to the real, material economy.[3]

While some observers have celebrated the beginning of the "paperless office," Matthews[4] shows that the ecological damage caused by manufacturing materials used for digital technology is growing across several environmental domains, such as energy consumption, water use and emissions of acids, metals, volatile organic compounds, chlorinated solvents, and other substances.

Conservation psychologists make a distinction between different types of impacts of environmentally significant behavior, depending on the extent to which human behavior changes the availability of natural resources or alters the structure and dynamics of ecosystems.[5] *Direct environment effects* related to the production of paper for print versions of magazines, for example, would be those that result from clearing forests, or in the case of digital technology from–disposing of electronic waste, which directly or proximally causes environmental change. Other behavior is indirectly environmentally significant, by shaping the context in which choices

are made that cause direct environmental change.[6] Behaviors that affect international development policies concerned with forests, raw material prices on world markets, national environmental and tax policies, individual savings and pension funds that are invested in more or less environmentally friendly projects can have a greater environmental impact indirectly than behaviors that directly change the environment.

Turning to the discussion of *indirect impacts*, the area is related to the effect of digital technology on de-materialization of production processes, as well as changes in distribution channels and transportation.[7] The *structural and behavioral impacts* section will examine research that focuses on the stimulation of structural change and growth in the economy, through impacts on lifestyles and value systems that are partially promoted by the content of magazine articles, partly through actual lifestyle changes.

Both the perception and the reality of the relationship between new media and environment, including interdisciplinary perspectives, will be explored in the section on *social and cultural impacts*. *Future impacts*-will address alternatives, with particular emphasis on the Cradle to Cradle model of production.[8]

Direct Impacts: Production Technologies and Environment

The effects of the production of magazines are associated with resource use and pollution that are related to the production of infrastructure and devices, from the failed dream of the paperless office to hardware electricity consumption and electronic waste disposal. The current debate about digital technologies and the environment is characterized by contrasting optimistic and pessimistic assessments.[9] Environmental optimists consider the effects of the digitalization of magazines to be positive because "information" is generally considered to be distinct from

material and energy, acting as a substitute for the use of resources such as paper. The digital world was seen as virtually "weightless."[10, 11]

By contrast, environmental pessimists demonstrate that digital technology is far from weightless. According to Don Carli,[12] there is growing recognition that digital media technology uses significant amounts of energy from coal-fired power plants, which are making a significant contribution to global warming. Greenpeace[13] estimates that by 2020 data centers will demand many times more electricity than is currently required. Production of machinery associated with digital technology involves mining, extraction, production, etc., of materials needed for maintaining digital technology. These include rare metals used for the production of e-readers or mobile phones, as well as the energy needed to run this technology, such as electrical batteries for computers.[14] Electronic waste produced by digital technologies counts for another serious environmental factor.[15, 16] Digital technology is now integrated into many ordinary consumer and commodity products, with the result that many of these devices and components are energy-consuming, have short life cycles and are composed of toxic materials.[17]

However, statistics for timber used for paper production and consumption in general and magazine production, in particular, are also disconcerting.[18] Paper produced from forests can negatively affect the environment in a number of ways: through the actual timber consumption, both from virgin and planted forests; through limited CO_2 reduction provided by these forests; and through space used for the production of timber. Waste products from paper can be recycled; however, recycled materials still require energy for transportation and the actual process of recycling, producing lower grade paper and in fact causing down-cycling, which entails turning valuable raw material (such as wood) into less or smaller material (such as printing paper) and

even a less valuable material after recycling (low grade toilet paper).[19] Downcycling is illustrated by the case of electronic waste:

> Encouraging recycling is often proposed as a way to lower the embodied energy of products. Unfortunately, this does not work for micro-electronics (or nanomaterials). In the case of conventional manufacturing methods, the energy requirements of the manufacturing process (1 to 10 MJ per kilogram) are small compared to the energy required to produce the materials themselves. For instance, producing 1 kilogram of plastic out of crude oil requires 62 to 108 MJ of energy, while a typical mix of virgin and recycled aluminum requires 219 MJ. To make a fair comparison, you have to multiply the energy requirement of the manufacturing process by three (1 megajoule of electricity requires 3 megajoules of energy) but even then (with 3 to 30 MJ/kg) conventional manufacturing processes appear to be quite benign compared to materials extraction and primary processing. . . Recycling is not a solution for energy consumption if all your energy use is concentrated in the process itself.[20]

In some countries, such as the Netherlands, (paper) waste is burned and used for generating electricity. However, this process eliminates valuable material–trees and paper–for one-time energy consumption.

Direct impacts of magazine production can be environmentally harmful because different production methods include both various types of resources being consumed and different kinds of pollution being produced. Definitive comparative studies of threats and benefits of electronic production of magazines in comparison to paper copies still need to be expanded. Suffice it to say that the direct impact of both digital and paper technologies is large and environmentally damaging.

Indirect Impacts: Production Technologies, Content and Environment

Since indirect environmental impacts can be more significant than direct ones, particular attention needs to be paid to both production and content impacts. In relation to production, indirect impacts are related to the effect of digital technology on paper-less magazines and changes in distribution channels and transportation.[21]

Negative indirect effects on the environment include falling prices for resource inputs, the proliferation of "intelligent" devices, and partial substitution.[22] For example, according to MIT researcher Timothy Gutowski,[23] manufacturing a one-kilogram of plastic or metal parts requires as much electricity as operating a flat screen television for 1 to 10 hours. In addition to considering the way digital media can create new possibilities for a better world, we also need to consider the less obvious impacts of the purchased energy, embodied energy, dark content, and e-waste associated with the growing use of digital media.[24] Last, but not least, as De Decker[25] has noted, the energy-intensive nature of digital technology is not due only to energy-intensive manufacturing processes. Equally as important is the extremely short lifecycle of most gadgets. A majority of computers and other electronic devices are replaced after only after a couple of years, while they are still perfectly workable devices. Addressing technological obsolescence would be the most powerful approach to reducing the ecological footprint of digital technology.[26]

Another indirect effect has to do with content and how printed or digital media actually inform the reader. For example, if we assume that online, open access journals have a larger readership than traditional print versions, the author of this article would hope that her ideas about the relationship between forms of production and environment would be widely disseminated and thus inform readers as to the best choices. Another example would include dissemination of information which could mislead the readers as to the most sustainable choices. The following section explains how providing information on how "green" a particular form of production is could have a large effect on readers' evaluation and choice of the less environmentally damaging methods of production.

Structural and Behavioral Impacts

Structural and behavioral impacts of both print and digital technology focus on the stimulation of structural change within society and growth in the economy. Impacts on value systems are partially promoted by the content of magazine articles, partly through actual lifestyle changes. Both structural factors—such as the power and ideology of neo-liberal capitalist political systems and consumer-based responsibility for environmental protection—can limit efforts at sustainability. The material saturation level is hardly sustainable, due to high material demands for houses, transportation, and consumer items, yet many (Western) consumers feel entitled to the negative spiral of globally increasing needs for resources. Depletion is not likely to cease. In the case of wealthier societies or consumers, scholars have warned of a "rebound effect"[27] in which "green" items are purchased to appease the wealthier consumer's conscience, contributing to resource depletion and waste.[28] In line with the rebound effect theory, scholars have noted contradictions inherent in the oxymoronic term "green consumption."[29, 30, 31] Wilk notes that there may even be a "moral rebound effect," where reiterating the message creates guilt, which "drives the continuing bulimic cycle of binge and purge so characteristic of contemporary consumer culture."[32] In the case of e-magazines this might imply that while consumers might *think* they are being more environmentally responsible by-reading e-magazines rather than paper, they may actually be discounting the environmental impact of digital technology. Similarly, reading a printed magazine advertised to be produced from 70% sustainable paper might lull the reader into overlooking the fact that the other 30% could come from virgin forests. Thus the reader accepts the "sustainability" of the whole without questioning the source of a part.

On the other hand, digital media can have a far-reaching effect of being able to reach a greater number of interested and responsible readers and thus better inform them of certain

environmental choices and options. Open access books and articles tend to be distributed and read much more speedily and widely than those published by a traditional press. Because the content of magazines can have a significant influence in informing the reader about negative environmental effects, as well as suggesting informed ways to move forward, more efficient distribution of the media, such as digital technology, can have a large behavioral impact upon the readers.

Social and Cultural Impacts

Both the perception and the reality of the relationship between new media and environment can be examined in the light of insights from research in ecological sociology and environmental anthropology. Sociologists Ulrich Beck[33] and Anthony Giddens[34] developed the concept of *risk society*, linking issues of sustainability to trends in thinking about modernity and popular discourse, in particular, the growing environmental concerns. While the perception of risks of climate change, industrialization and the like may be socially "manufactured," influenced by the media or simply imagined, scientific and technical experts ~~may~~ also disagree about which production process or product is more harmful, as well as how such processes and products can be improved.

Environmental sociologists Catton and Dunlap[35] have argued that environmental risks are partially a result of the process of socialization. However, they have also emphasized the need to explicitly address the reality of environmental risks as well as anthropocentric bias in the perception of environmental problems. In their much-cited article, "What environmental sociologists have in common (Whether concerned with 'built' or 'natural' environments)," Dunlap and Catton[36] assert that social scientists tend to underplay environmental problems and to subordinate conservation to social and economic interests. Similarly, environmental anthropologists Kopnina and Shoreman-Ouimet[37] have argued that anthropology historically tended to focus on cultural variables and cultural interpretations of the environment, rather than seeking solutions to environmental issues that occur globally.

Anthropocentric bias in sociology,[38] anthropology[39, 40] and even in the scholarship of education for sustainable development[41] indicates that members of the social science community tend to view issues such as the depletion of natural resources and pollution in strictly

instrumental terms—as something that negatively affects humans and can be solved by a technological fix. In anthropocentric thought, humans are largely in control of the surrounding world, and problems arising from modern living can be taken care of through technological development and by adjusting certain social structures.[42]

In the case of paper versus e-magazines, the implications of this anthropocentrism can be described as two-fold. First, anthropocentrism manifests itself through dominant social and cultural norms and values of neo-liberal capitalist industrialist societies that view human welfare, material satisfaction, and consumption as something to be aspired to; and second, these values are internalized by ourselves, the social scientists of culture or media. In the first case viewing any object—be it e-magazine or paper—as "resource" can already be problematic. Resources such as metals used for digital technology or timber used for making paper support the "economic capture" approach to natural resources, in turn commodifying or putting a price on "product" without consideration of its intrinsic value. Many anthropologists question how "resource use" translates into global discourses, criticizing the very idea of converting "nature" or "wilderness" into "natural resources" or "ecosystem services," the way powerful Western institutions such as the World Bank or the United Nations do.[43, 44] It is worrying that the non-economic value of what is actually used to make either paper or digital magazines is rarely acknowledged. Concerns about protecting forest or wilderness area, which is being mined for valuable metals used for computer technology, are not necessarily contingent solely on social interests. For example, planted forests could when harvested, perhaps better satisfy the economic need. Due to such extractive activities, extinction of some species of plants and animals could conceivably come to pass without jeopardizing the survival of the humans. People might be materially sustained by monocultures of cultivated plant and animal species, as well as minerals

and other 'resources' made to yield services and products required for human life.[45] It is thus questionable whether a purely economic approach to environmental protection is adequate to address the environmental impact of both print and digital technology.

Future Impacts: Cradle to Cradle Framework

As an alternative to present models of either paper or material production, the Cradle to Cradle model of production deserves special consideration. William McDonough and Michael Braungart, in *Cradle to Cradle: Remaking the Way We Make Things*,[46] conceptualize sustainability differently from the mainstream idea of eco-efficiency. The Cradle to Cradle framework provides an ideological and technical framework that seeks to create industrial systems that are not just efficient but are essentially waste free. McDonough and Braungart ask us not just to contemplate minimizing the damage, but to imagine how contemporary waste might no longer exist.

The Cradle to Cradle approach is an argument that being less bad is not good enough. Continuing to use a system that generates massive amounts of waste in the endless spiral of production and consumption, the authors argue, will only prolong the bad system. The familiar reduce, reuse, recycle and regulate adage serves to maintain cradle to grave production rather than stimulating fundamental change towards eco-*effectiveness*.

McDonough and Braungart suggest that every product can be designed from the outset so that after its lifetime is over, the product will continue to live while providing nourishment for something new: that is, by becoming a nutrient within either a biological or technological cycle. Cradle to Cradle theory identifies three key design principles, which inform human design from a Cradle to Cradle perspective: (a) waste equals food; (b) use current solar income, and (c)

celebrate diversity. These three principles are deduced from the intelligence of natural systems as explained below.

Waste equals food. Waste does not exist in nature because the processes of each organism contribute to the health of the whole ecosystem. A fruit tree's blossoms fall to the ground and decompose into food for other living things. Bacteria and fungi feed on the organic waste of both the trees and the animals that eat the tree's fruit, depositing nutrients in the soil in a form ready for the tree to use for growth. One organism's waste is food for another, and nutrients flow indefinitely in cycles of birth, decay, and rebirth. In other words, *waste equals food*.

Understanding these regenerative systems allows engineers and designers to recognize that all materials can be designed as nutrients that flow through natural or designed metabolisms. While nature's nutrient cycles comprise the biological metabolism, the technical metabolism is designed to mirror them; it is considered a closed-loop system in which valuable, high-tech synthetics and mineral resources circulate in cycles of production, use, recovery and remanufacture.

Within this cradle-to-cradle framework, designers and engineers can use scientific assessments to select safe materials and optimize products and services, creating closed-loop material flows that are inherently benign and sustaining. Materials designed as biological nutrients, such as textiles and packaging made from natural fibers, can biodegrade safely and restore soil after use.

Use current solar income. Living things thrive on the energy of the sun. Trees and plants manufacture food from sunlight, an elegant, effective system that uses the earth's unrivaled and continuous source of energy income. Despite recent precedent, human energy systems can be nearly as effective. Cradle-to-cradle systems—from buildings to manufacturing processes—tap

into current solar income by using direct solar energy collection or passive solar processes, such as day-lighting, which makes effective use of natural light. Wind power—thermal flows fueled by sunlight—can also be tapped.

Celebrate diversity. The celebrating diversity maxim does not necessarily refer to the popular idea of cultural or social diversity, but to respect of diversity in natural systems. From a holistic perspective, natural systems thrive on diversity. Healthy ecosystems are complex communities of living things, each of which has developed a unique response to their surroundings that works in concert with other organisms to sustain the system. Each organism fits in its place, and in each system, the fittest thrive. Needless to say, the long-term perspective is needed, because the introduction of an invasive species can enhance diversity for the immediate term while virtually destroying that diversity over time.

This idea is similar to that of biomimicry, inspired by Janine M. Benyus in her 1997 book, *Biomimicry: Innovation Inspired by Nature*. Biomimicry is a new science that studies nature's models and then imitates or takes inspiration from these designs and processes to solve human problems.[47] As do bionics and biomimicry, C2C takes nature's diversity as a prototype for many models for human designs, tailoring designs to maximize their positive effects in order to "fit" within local natural systems and enhance the local landscape where possible. McDonough and Braungart have designed a number of urban areas and buildings. For each, they have taken into account the local climate, materials, and both human and ecological needs.

In short, by modeling human designs on nature's operating system—generating materials that are "food" for biological or industrial systems, tapping the energy of sun, and celebrating diversity, cradle-to-cradle design creates a new paradigm for industry, one in which human activity generates a wide spectrum of ecological, social and economic value.

In relation to magazines, the C2C approach can suggest practical applications of these principles, similar to other designs that those ascribing to C2C principles have used. The Melchar group, for example, which produces DuraBooks, advertises the books as good for the environment:

> Made in such a way to be upcyclable, the synthetic "paper" can be melted down and reused in perpetuity, thus sparing trees and reducing toxins in the earth's ecosystem. DuraBooks are also non-toxic and child safety tested.
>
> William McDonough, recognized by *Time* magazine in 1999 as a "Hero for the Planet," states "Unlike the paper with which we are familiar, [the DuraBook] does not use any wood pulp or cotton fiber but is made from plastic resins and inorganic fillers. This material . . . is a prototype for the book as a 'technical nutrient,' that is, as a product that can be broken down and circulated indefinitely in industrial cycles—made and remade as 'paper' or other products."[48]

Such designs still need to be carefully evaluated, but their potential to contribute true alternatives to either paper or digital publications can be profound. The issues to consider will be the entire supply chain used for the production of alternative materials, economy of scale and possibility of mass production and its consequences—not just for niche markets of concerned readers, but globally.

Conclusions

Scholars' research agendas include the full range of communication-related questions, from magazine management and economics to content of periodicals for the spectrum of periodicals for the general public, the workforce, and organizations whose explicit goals focus on industry-related questions. The questions that are needed foci of future research for both scholars and researchers, industry professionals and practice, include those that relate to direct and indirect environmental impacts of print or digital technologies, as well as socio-economic and behavioral impacts of alternative technologies.

In this chapter, I have attempted to discuss what research exists and what is needed—to build the bridges between what is known and what is not, for both the scholarly endeavor and the practicing professional in editorial and business decision-making roles. The strengths and weaknesses of different technologies call for urgent research into both what and how magazines are being produced, and what, content-wise, is actually written about these strengths and weaknesses in the magazines themselves. The present chapter is limited to outlining a number of directions which both the scholar and a media executive could explore in order to ascertain the challenges, opportunities and the choices presented by new and alternative technologies. Both direct and indirect environmental impacts of magazine production technology and content need to be further investigated before informed choices can be made.

The Cradle to Cradle framework offers scholars and practitioners alike a vision for moving away from the established anthropocentric theoretical paradigm and from an unsustainable cycle of production and waste in practice. In order for the scholarly agenda to move forward, and for optimal industry applications, the Cradle to Cradle framework has the impressive strategic potential to move the industry from current state-of-the-art technology, which is hardly sustainable in the long term, toward truly innovative solutions for the future of magazines.

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