Resourceful Thinking about Printing and Related Industries: Economic Considerations and Environmental Sustainability

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Abstract

Increasing population, total economic volume, and human consumption levels have resulted in problems of resource shortages, climate change, ozone layer depletion, land regression, and deteriorating environmental pollution. Printing and related industries constitute one of the major sources of environmental pollution due to heavy energy and resource (materials) use. Therefore, there is a need to adopt resourceful thinking regarding activities in the printing and related industries, so they can contribute to environmental protection by adhering to greener, eco-friendly, and sustainable practices. This article discusses strategies that these industries could adopt, which would put their businesses on sound economic footing as they adhere to sustainable business practices that contribute to and safeguard the environment.

Introduction

Resourceful thinking about printing and related industries is much more than a focus on hardware and software acquisition in an effort to amass a profit. It is about finding the best tool to get the job done, lowering overhead costs, getting more for less, while eliminating or reducing the negative impact on the environment. As companies realize that wealth is created through technology and by adding value to natural resources, efforts need to be made to ensure that sustainable practices are put in place to protect the environment. Resourceful thinking is about meeting the challenges of creating an environment that fosters scientific discoveries and technological development. It involves the ability to know the demands of the environment, to respond to these demands with technological solutions, to create solutions that link and match the research with the actual demands of the environment, and to structure an environment that moves resourceful thinking through the global economic climate with a view of achieving the solutions needed to address business problems.

Some of the strategies that printing and related industries can use to achieve the aforementioned goals include contributing to environmental and economic sustainability; using socially conscious, environmentally friendly products and packaging; establishing safety and efficacy in product design; using renewable and recyclable resources; supporting biodegradability; promoting sustainable harvesting practices; and being accountable to present and future generations of packaging products. These strategies are addressed in detail in this article; examples are given of how they are being used successfully in the industry.

Many printing and related companies have realized that wealth is created both through technology and by adding value to natural resources. Businesses therefore are engaging in technology transfer and technology development and must set standards for sustainable and research responsibility as they relate to their companies. Such standards should include but not be limited to safety, effectiveness, research efforts, honesty regarding packaging sources and claims related to packaging; affordability, build value to equity for company, respect for the standards of the Food and Drug Administration, respect for the standards of the Federal Trade Commission, and respect for the standards of other organizations.

Technological progress is frequently sparked by creating and advancing technology, economic growth, job creation, and resourceful thinking. Resourceful thinkers are a special people who have the ability to sell or market ideas. They possess a particular set of qualities, such as vision, courage, initiative, commitment, persistence, drive, and ambition. As a result of high energy and chemical use, and associated wastes, printing and related industries constitute a major source of pollution from wastes and resources used in their production processes.

Similar to other industries, well-run printing and related businesses must use strategic goals. These goals should include "sustainability," in terms of the business being green, renewable, and recyclable as well as profitable. Therefore, resourceful thinking about success in printing and related industries must hinge on building environmentally responsible processes that are lean, green, and sustainable while being profitable for stakeholders.

Literature Review

According to Big Sky Print (n.d.), printing is the fourth most polluting industry in the United Kingdom—the result of both high energy and high chemical use. Reducing the impact of the environment demands is more than looking beyond less energy use. It must also include making good purchasing choices. In printing and related industries, the choice of a printer and the use of recycled products must be followed by addressing both all daily activities and the design and printing processes in order to ensure sustainability. As noted by Big Sky Print (n.d.) on its website, using recycled products results in certain advantages: lower resource use, less landfills, and not harming forests. These are financial gains to the industries; however, at the same time they can result in sustainable practices with benefits to environmental protection as well as the health and safety of workers. Some of the major materials and by-products of processes in printing and related industries include the following: energy, water, wastes, emissions, and inks. The table that follows lists some steps that can be taken by printing and related industries to ensure sound environmental practices are entrenched in their companies.

Materials/By-Products	Suggested Sustainable Practices
Energy	Use 100% locally sourced renewable energy to reduce costs and environmental impacts.
Water	Reduce water usage by adopting waterless printing and by using digital processes. Also, by recycling water, harvesting rainwater, and cleaning contaminated water before disposal.
Wastes	Reuse and recycle leftovers (printing plates, ink tins, pallets, packaging) rather than dumping them into landfills.
Emissions	Eliminate use of all pre-press chemicals.
Inks	Use vegetable-based inks rather than petroleum-based inks. Vegetable-based inks are derived from vegetable oils, which are renewable resources. Inks made from them are easily removed from waste paper during de-inking. Also, pigments from vegetable-based inks do not contain heavy metals, so they are safe. Furthermore, adopt zero-alcohol printing processes.

Concerns for environmental protection and the role of printing and related industries have received global attention and are being discussed at international forums to find lasting solutions to the problem. For instance, at a forum on *Printing and the Environment* hosted by the World Printing and Communications Forum (WPCF) Organization in Dusseldorf, Germany in June, 2008, the President of the China Printing Technology Association, Yu Yongzhan, stated the steps they have taken to ensure sustainable environmental practices in the printing and related industries in China. Some of these steps include:

1. Elimination of many small-sized printing enterprises that pollute the environment through the use of outmoded technology and bad management and the emergence of large-scale backbone enterprises capable of clean production.

2. Enhancement of sustainable development capabilities.

3. Reconstruction of the traditional printing industry through application of information technology as well as the promotion and application of new-type raw and auxiliary materials.

4. Strengthened management of packaging materials and their recycling to reduce and reuse wastes as well as to make them harmless.

5. Regulations on energy-saving, emission reduction, and abandonment of laggard enterprises.

Therefore, the green revolution that has been launched in the Chinese printing industry centers around reduction of costs, processes, and energy in addition to development of value-

added services, and environmental protection (Yu, 2008).Green practices have become increasingly important as companies become concerned about impacts their activities have on the environment. Therefore, printing and related industries must establish environmental management systems to show their commitment to environmental protection. Actions to consider include setting an emissions goal, being specific in communicating what has been accomplished, making products green, becoming efficient, and seeking certifications. These initiatives require ongoing commitment, should be taken seriously, and should be a key component in all business decisions (Barker, 2008). Some of these initiatives are as follows:

a. **Establishing an emissions reduction goal.** Even with no federal legislation in place to uniformly regulate emissions, companies could actively seek opportunities to reduce greenhouse gas emissions and stay ahead of the curve.

b. **Being specific in communicating accomplishments and the results achieved.** For instance, state that the company achieved a 20% reduction within five years. If the goal is stated without adding a time period, it is difficult to clearly understand the results. Also, ensure the reasons behind the accomplishments are clarified. For example, show the results emanated from improved manufacturing or production processes and/or by utilizing renewable resources and not simply reductions achieved by shutting down factories or cutting jobs.

c. **Greening products.** There is increasing demand for environmentally responsible products. Therefore, making products green will be beneficial for the business. One way to make products green is by adding recycled content to the product or its packaging. Also, removing as many hazardous chemicals as possible from the product and packaging makes it greener. This helps the bottom line as much as it helps the environment. Hazardous waste requires additional training for the staff to handle and is expensive to dispose of. These could be considered additional operating costs, but in the long run the costs are recovered via a company's good image earned by company as a result of the greening effort.

d. **Efficiency.** Lean manufacturing could be used, which decreases wastes and reduces the impact on the environment. In addition to this are the reduction in energy and water usage. These are clear demonstrations to consumers that the industries are committed to sustainability.

e. S**eek certifications.** Certifications are ways to demonstrate that the business is committed to environmental management and green practices. Examples of certifications that can be sought include the Forestry Stewardship Council (FSC) certification and the ISO 14001: 2004. The FSC awards certifications to facilities that show commitment to reducing their long-term impact on the environment by adhering to strict environmental, social, and economic standards.

Contribution to Environmental and Economic Sustainability

Many printing processes use chemicals, some of which are potentially harmful to the environment. Printing companies represent one of the more polluting industries (Blansch, 1995). Printing processes are often accompanied by pollution, which arises as an inevitable result of production processes caused by high-energy processing and the use of paper, ink, and chemicals (Masurel, 2007). Resourceful thinking about printing and related industries involves directing attention to concerns about the environment and the health of workers even as printing companies seek to make profits. As a result, "adopting environmentally friendly business practices has become an important focus for the printing industry" (Assadi, 2009, p. 18). Many printing and related industries have put in place systems to ensure that their activities cause little or no damage to the environment as well as the health and safety of their workers. An example is the Oji Paper Group (OPG), the second largest paper company in Japan.

According to Oji Paper Group (n.d.), based on information posted on its website, OPG obtains 60% of its pulp from recovered paper and the rest from its tree plantations that are managed in strict conformance to Japan's environmental standards. OPG has taken initiatives to help prevent global warming by making

concerted efforts to reduce energy consumption and to switch from fossil fuel to energy generated from waste. Although OPG sets the targets of reducing both fossil energy consumption per unit of production and fossil fuel-based CO2 emissions per unit of production by 20% from the fiscal 1990 levels by 2010, it actually achieved both targets in 2006.

Based on two principles of *forest recycling* and *paper recycling*, OPG over the years has developed a sustainable recycling-oriented business model in its effort to protect and preserve the nature of the world. In terms of forest recycling, the overseas forest plantation was expanded from 200,000 to 300,000 hectares with trees already planted in over 170,000 hectares. In terms of paper recycling, the group's recovered paper utilization rate has already reached 60% with efforts to push this level higher. In addition to forest recycling and paper recycling, there are six other activities included in the group's *Action Guidelines.* These are promotion of global warming countermeasures, reinforcement of environmental improvement measures and environmental management systems, development of production technologies and products that minimize environmental impact, reduction and effective utilization of waste, transfer of environmental protection technologies to other countries, and building relationships of trust with other stakeholders.

OPG operates 16 mills in Japan and has subsidiaries and affiliates in overseas markets in Asia, Europe, and the Americas. The group annually manufactures over seven million tons of printing and writing papers, corrugated board and boxboard as well as packaging and wrapping papers, paper-based containers, thermal papers, plastics, and disposable diapers. It is also involved in the production of chemicals for paper making and packaging.

Socially Conscious, Environmentally Friendly Products and Packaging

Evidence of increasing mainstream public support for issues relating to climate change and our carbon footprint can be seen in the success of Al Gore's film, *An Inconvenient Truth.* A carbon footprint is the result of the imbalance between the collective output of carbon dioxide and other greenhouse gases by human activities and the earth's ability to process those (Parsons, 2006).

The print life cycle involves the fiber, minerals, chemicals, and energy used to make the paper, ink, and other essential materials as well as the energy and materials used in print manufacturing and distribution up to the final disposition as wastes. However, transportation of raw materials to paper mills, printer, consumer and then final disposition as well as recycling of products and the post-consumer recycled paper content are also important and should be considered aspects of sustainable product life cycle management. According to Parsons (2006), "Because printing is ubiquitous and since it is likely to remain that way, the life cycle aspects and impacts of printing and publishing are likely to come under increased scrutiny" (p. 5). The American Center for Life Cycle Assessment (ACLCA) defines a life cycle as consisting of consecutive and interlinked stages of a product system, from raw material acquisition or generation of natural resources to the final disposal (ACLCA, n.d.).

Decisions taken at multiple stages of the printing process should therefore take into account the need for socially conscious, environmentally friendly products, as well as packaging and disposal systems that support the growing movement for environmental sustainability with regard to the printing, publishing, and related industries. A number of printers are showing commitment to co-generation and the purchase of green energy as a demonstration of the growing concern about climate change and energy security. For instance, Cenveo Anderson Lithograph, a Los Angeles-based printer generates its own electricity. In addition, the company has a system in place that captures and destroys all of the volatile organic compounds (VOC) emissions generated by its printing operations, reduces the nitrogen oxide and carbon dioxide emissions associated with combustion of natural gas fuel by as much as 85%, and produces lower emissions than the local electric utility (Parsons, 2006).

According to Assadi (2009), Greener Printer, a commercial printer, offers sustainable, eco-friendly printing and mailing services to local and national companies. The company uses technology to eliminate inefficiencies, streamline communications with customers, and make operations eco-friendly. An approach that has resulted in an immediate impact is the adoption of an all-digital workflow from the design and

pre-production to proofing and delivery of files to the press. By using a Job Definition Format (JDF) to route documents through the workflow steps, this company is able to specify the ink zone settings, press setup instructions, and cutting and folding directions for JDF-enabled devices. A major advantage is that JDF-enabled PDF files speed up throughput, reduce errors, lower production costs, and conserve paper and energy. In addition, the company computerizes pre-press operations to eliminate the need for photochemicals, established a recycling program for solvents, and uses alcohol-free printing, recycled paper, low VOC inks, and energy-efficient equipment.

The Kilmer, Wagner, and Wise Paper Company, a paper and shipping products distribution company, is committed to environmental packaging. On its website, it states that all its products (corrugated cartons, bubble pack, foam, poly bags, can liners, towels, toilet tissue, Kraft wrap, starch-based flowables, etc.) are made of partial to 100% recycled materials. For example, the company claims that its flowable (PELASPAN-PAC NATURAL) is completely natural, 100% biodegradable with no CFCs and no dependence on oil, is nonstatic, non-air-polluting, renewable, recyclable, and reusable (KWW Paper, n.d.).

Establish Safety and Efficacy in Product Design

Some of the measures that can be taken to enhance safety and efficacy in the design of printing products include the use of water-based aqueous coatings to protect printed pieces. This provides a high-gloss surface that deters dirt and fingerprints and is more environmentally friendly than UV coatings. Also, inks that are vegetable-based, primarily soy, and are both gentle on the environment while producing bright, high-quality images should be used. Paper should be milled "Elemental Chlorine Free." This is because trees are a renewable resource, but dioxin (used to bleach paper white) is permanent. UC Davis Reprographics (n.d.) stated on its website that it is committed to preserving natural resources, reducing energy usage, and reducing toxins emitted into the air. The company's other sustainable practices include:

a. Alternative paper choices - using treeless papers made from alternative sources, such as bamboos, sugar cane, stone, and plastic. Also, the use of 100% post-consumer waste-recycled paper.

b. Online printing using Repro Graphics - placing orders, sending files, and receiving electronic proof from computer.

c. Recycling - doing this for all paper trimmings, ink, and toner cartridges.

d. On-demand printing - using digital color press.

e. Vegetable-based inks - providing for chemical-free water-based printing

Additionally, there are sustainable efforts that have been introduced to reduce wastes and to enhance the efficacy of the print production process. These include:

1. The use of eco-board poster boards - these are used to mount posters on materials made from recycled cardboard.

2. CD and DVD production - offer discs to reduce paper.

3. Poster stand rental - simply rent and reuse rather than purchasing them.

4. Environmentally friendly direct-to-plate imaging.

5. Two-sided printing - to be used as necessary; reduces paper use.

Renewable and Recyclable Resources

Recycled paper is readily used in the newsprint and packaging sectors. The use of recovered fiber in newsprint reached 87.5% in Europe in 2007, with many of the countries including the United Kingdom achieving 100% (Cox, 2009). Recycling paper is widely practiced in many businesses. In addition, companies are moving into recycling of all kinds of waste to cut costs and protect the environment. For example, ecoproducts.com stated on their website that they compost or recycle all wastes at their facility. They compost all food waste, PLA packaging scraps, food service ware, the waxed backing of UPS labels, and more. Examples of items they recycle are pallet wrap, scrap wood, scrap metal, printer cartridges, paper, co-mingled containers, and cardboard.

Biodegradability

Biodegradable products are capable of decomposing into nontoxic soil, water, carbon dioxide, and methane. The Biodegradable

Products Institute (BPI), a non-profit organization of individuals and groups from government, academic, and business sectors, has set standards for biodegradability. The institute's compostable label program has been used to educate legislators, manufacturers and consumers about the importance of scientific-based standards for biodegradable materials (BPI, n.d.).

The use of biodegradable padding materials for packaging instead of petroleum-based foam "peanuts" that are harmful to the environment is an example of a way to adopt biodegradability in fostering environmental sustainability. Several companies promote eco-friendly, biodegradable products. For instance, ecoproducts.com listed a number of "ecoproducts" on its website, including compostable paper food containers (soup cups, food containers made from corn, take-out boxes), and biodegradable bagasse soup containers.

Promote Sustainable Harvesting Practices

Efforts to promote sustainable harvesting practices are crucial for the printing industry and this could be in terms of sustainable energy harvesting as well as good harvesting practices for other products in the print life cycle. Printing requires a high amount of energy, water, paper, inks, and chemical usage. Printing and related industries should consider and adopt harvesting best practices to drive down production costs as well as to promote environmental sustainability. For instance, in the area of energy harvesting, an energy harvesting power management system capable of capturing, converting, storing, and delivering energy to power the systems. An energy harvesting system will typically be composed of a collector or transducer device. The energy collected is then converted to a form that can be used depending on whether it is for lighting (photovoltaic or solar energy), heating (thermoelectric), movement (kinetic), and so on. The final stage of the system is to condition it for storing the energy and managing it in terms of distribution to where it is needed based upon system operations or other needs in the plant.

Other best practices for sustainable harvesting could include placing trays and collection boxes at strategic points in the plants to collect recyclable materials and products, such as used ink cartridges, paper, chemicals, or water. These materials are then transported to the recycling system and new usable products are produced from them. In addition to saving costs, the impact of these best practices on the environment is beneficial to everyone. The important point is to ensure that this is communicated to everyone and periodic reports demonstrating the effectiveness of this approach as well as the gains that have been realized from it should be made known to all. This will boost morale and make everyone in the company buy into the adoption of these practices in the plant.

Present and Future Generations of Packaging Products

Considerations for the packaging of products of present and future generations require thinking about sustainability of the packaging. In terms of product packaging, the Sustainable Packaging Coalition (SPC) has defined sustainable packaging as a packaging that meets the following conditions:

a. Is beneficial, safe, and healthy for individuals and communities throughout its life cycle.

b. Meets market criteria for performance and cost.

c. Is sourced, manufactured, transported, and recycled using renewable energy.

d. Maximizes the use of renewable or recycled source materials.

e. Is manufactured using clean production technologies and best practices.

f. Is made from materials healthy in all probable ends-of-life scenarios.

g. Is physically designed to optimize materials and energy.

h. Is effectively recovered and utilized in biological and/or industrial cradle to grave cycles.

This definition is in tandem with the vision and mission of the coalition. For instance, the vision of SPC is that all packaging be responsible sourced, designed to be effective and safe throughout its life cycle, meets market criteria for performance and cost, made entirely using renewable energy, and when used is recycled efficiently to provide valuable resources for subsequent generations.

According to the Paperboard Packaging Council (PPC), sustainable advantages of using

paperboard products in packaging are in terms of materials sourcing, physical design, clean production, and effective recovery. These advantages are listed as follows:

Materials sourcing. A sustainable material using specially-raised crop trees, waste products like sawdust and wood chips, and recycled paper/paperboard fibers. Sustainable wood fiber from farm-raised trees is the primary raw material in paperboard packaging. The forest products industry plants 1.7 million trees a day—planting five for every one that is harvested. Further, paperboard is recyclable, and collected fiber returns to the mill for paperboard production.

P**hysical design.** Improved designs and manufacturing processes have reduced raw materials needed without sacrificing performance. Reduced need for labels or additional information displays—most information and brand information can be printed on paperboard. The weight of paperboard has fallen, whereas board strength has increased, allowing packages to be designed with lighter, thinner paperboard.

Clean production. Continuous improvement in production processes and new materials. Modern paperboard production has limited chemical usage and lowered air emissions in paperboard production.

Effective recovery. Paperboard packaging is a valuable resource considering that the fibers in paperboard packaging can be recycled, and usually are, multiple times. Paperboard can also be reused prior to recycling to store other materials after its contents have been used.

Summary

The main focus on resourceful thinking regarding the printing and related industries is to direct attention on ways to do things differently in order to gain economic benefits so that businesses can survive but at the same time make the world a better place for us all to live in. Resourceful thinking is about the innovative things that the printing-related industries can do to adopt sustainable business practices that could in turn yield great economic dividends.

Green businesses are very likely to succeed if there is the commitment by all stakeholders, especially the top leadership. These commitments and efforts should in turn be turned into marketing advantages for the business. Even though going green comes with some initial costs, it should be realized that these costs could in time be lower than continuing to pollute. Recycling paper, packaging, ink tins, recovering fiber, and so on and reusing them for production purposes will inevitably be less expensive than sending all these things to landfills and polluting the environment.

Going green could actually save money, create jobs, and support local communities. In order to demonstrate commitment to sustainable practices, it is important that the workforce be educated. Management must demonstrate to them that the business is serious about waste reduction and going green. If this is done, employees will be attracted to it and those that buy into the idea will come up with innovative ways to pursue these initiatives. The end result will be an increase in the bottom line of the organization. In addition, the commitment to these goals could help boost customer satisfaction efforts. Customers can feel satisfied when they are provided assistance with how to make sustainable business decisions.

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