Turning Designs into Businesses:  
Business Plan for HP’s First Sustainable Printer  

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A Path Toward Sustainable Printing Solutions
PRODUCT SUMMARY

Market Opportunity:
HP Olive was conceived from a dual recognition of the wasteful nature of inkjet printer use and the general discontent users feel toward the existing business model that propels the printer industry. Research shows that the vast majority of inkjet printer use at home accomplishes very temporary tasks. Directions, email, recipes, websites and boarding passes are among the most common types of print jobs – all of which become useless within two weeks. HP Olive employs several novel approaches to break away from the old wasteful system. Features include recycled material, modular design, biodegradable cartridges and revolutionary ink technology like the use of recaptured ink, soy-based ink and disappearing ink.

Current Consumer Experience:
The general discontent with the printer industry comes from its ‘razor blade’ business model - sell the printer below cost and make up for the loss in ink sales. Many users have resorted to exploiting rebates or even buying a new printer each time their ink was depleted – a strategy that often costs less than buying ink. At the center of the two issues is the problem of sustainability. The common process of printing boarding passes, coupons, articles, receipts, credit card statements, recipes and directions reflects three significant traits of the printing business; the burden of printing is being shifted to the consumer. Viewing documents digitally has not replaced the need for printed material. There is an understanding that information is outdated quickly therefore it is printed on-demand right when it is useful. Considering the paper waste stream of useless prints, plastic cartridge refills and eventual improper disposal of the printer, printers create an extremely unclean category within the overall home electronics landscape.

PRODUCT FEATURES AND COMPONENTS

Recycled Material Content:
The product’s outer shell is made entirely of 100% post-consumer (recycled) pressed-paper pulp, which is also recyclable by the Olive consumer.

Modular Design:
Internally, the printer components are composed of three segments: (a) print head, (b) drive mechanism and (c) feed mechanism. The largest component - the feed mechanism is made from just one polymer. Though it cannot be recycled in municipal recycling streams, the material can be adapted to fit many industrial recycling processes. The print head and drive mechanism are intended for re-manufacturing or re-conditioning to further their lifecycle.

Material Reduction:
Essential to the overall function of the HP Olive is a reduction of materials from the construction to the packaging. Consumers will use their computer to power the printer, thereby eliminating the need for sourcing or engineering the power source components; this will also reduce energy consumption. The interface will be computer-based. Using onboard memory for documentation in lieu of printed manuals or CDs will also decrease production and shipping costs, while reducing the negative environmental impact in relation to the whole product lifecycle.
**Biodegradable Cartridges:** Rather than rely on ink cartridges that are made of dense and non-recyclable combinations of plastic, HP Olive’s cartridges consist of a pouch (b) made of a thin membrane of PET (polyethylene terephthalate) encased in a dense starch shell (b). The cartridges do not ‘live’ inside the printer, rather they top-off an internal reservoir. Once the cartridge is used, the shell snaps apart, separating the two components. The starch shell can be thrown in the toilet where it will disintegrate quickly or in a compost pile; the PET pouch is placed in the recycle bin where it will be recycled among disposed PET products like water bottles.

**Ink Technology:** A combination of three unique advances in ink technology would position the HP Olive as a truly disruptive innovation within the printer industry.

- For selected jobs, the printer would use *recaptured ink* that is generated by the printer’s internal print head cleaning process. This ink is held in a reservoir and can be selected for print jobs that are not very important and where the color of ink is irrelevant.
- The color and black inks would be *soy-based*. Industry leaders report it takes about 2 liters of oil to make the one pound of toner powder required for each oil-based cartridge. The environmental benefits would be significant and appealing to the conscious consumer.
- The printer would include a cartridge of *disappearing ink* called thymolphthalein, which could be used for temporary documents. “About two to five pages are printed in the office for daily use, like e-mail messages and Web pages, which are discarded or recycled after being read.” This volatile ink that disappears over time would allow a piece of paper to be reused, thereby reducing waste.

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**INTRO TO HEWLETT PACKARD**

**Market Share:** Aligning the Olive with Hewlett Packard takes advantage of their dominant market share within the printer market. HP maintains in excess of 56% of overall market share in their industry. However, the gap among the five big players (HP, Lexmark, Canon, Dell and Epson) has narrowed since 2008; while HP retains its number one share of the printer market at 29% today, two years ago HP enjoyed a 41 percent share. To address this, HP has taken proactive measures by allocating its highest marketing budget for the past few years in an attempt to retain leadership in this competitive market. The innovative HP Olive concept will extend their brand image into an emerging market of environmentally-conscious consumers while taking advantage of the production efficiencies proposed by the product and fulfilling their corporate social responsibility goals.

**A Culture of Innovation:** With over 9,000 patents globally and adding 1,000 new ones each year, HP is committed to product innovation. In the early years of the printer business, there were daunting uncertainties about how the market would evolve. While Moore’s law (the doubling of transistors every 18 months) is well known, similar technological trends for printers make the printer market as demanding.

Over its 20-year reign HP’s value chain has evolved dramatically; this has encouraged the brand to extend product lines and offer new services. "The evolving value requirements of customers and potential customers should drive every decision a business makes about what activities to
focus on; what innovations to add to products; what to outsource; and when and how to change. To enhance the brand even further there must be consideration for the right R&D strategy, as well as better execution of the product life cycle management processes; in tandem, they need to speed up product development which is critical in this rapidly changing markets. HP’s open innovation labs address this.

**CSR Environmental Goals:** HP, like many corporations, is looking to address the growing interest in environmentally-conscious consumerism but establishing an ambitious set of corporate social responsibility goals.

- **2011 Goal:** HP will reduce the energy consumption of HP products\(^1\) and associated greenhouse gas (GHG) emissions to 40 percent below 2005 levels. This replaces the 2010 goal to reduce combined energy consumption and associated GHG emissions of HP operations and products to 25 percent below 2005 levels by 2010, which HP has already met.\(^x\)

- **2011 Goal:** 40 percent or more of HP-branded paper sold will be Forest Stewardship Council-certified or have more than 30 percent post-consumer waste content.\(^x\)

- **2011 Goal:** Continue to divert at least 87 percent of solid (nonhazardous) waste from landfill globally.\(^xi\) For instance, HP developed a closed-loop system for recycling printer cartridges. Their Lavergne Group facility handles a million pounds of plastic every month. In the closed loop system, the plastic lives again as new cartridges. HP has made more than 500 million printer-ready cartridges through this process since 2005.\(^xii\)

- **Legislation:** On March 25, Maine became the first state in the U.S. to enact an extended producer responsibility (EPR) law; this type of legislation will become more prevalent. Some 19 states have rules requiring takeback of electronic equipment.\(^xiii\)

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**INDUSTRY ANALYSIS**

**Internal Rivalry and Market Size:** The printer industry is characterized by presence of few dominant players and high exit costs. Profit margins are lower or in some cases are negative for printer sales in the retail category. Manufacturers try to compensate for this by offering higher margins in associated ink cartridges. For the retail segment of the market, firms compete on price. The industry concentration is high and thereby mirrors an oligopolistic scenario.

The popularity of digital cameras and the convergence of digital media offers consumers an unprecedented ability to quickly and cheaply produce their own printed materials. Coupled with the massive ($3 billion) scrapbooking market,\(^xvi\) the demand for inkjet printers is solid. According to estimates, the total global ink-jet printer market totals $45 billion annually;\(^xvii\) $32 billion of that figure accounts for ink sales alone. Although separating personal and business uses of paper is difficult, statistics show the annual worth of the copy-style paper industry exceeds significantly beyond the one trillion mark. Far from being an emerging trend, personal / small business inkjet printers have penetrated all primary outlets and have expanded after-market solutions through a vast variety of distribution channels.
**Buyer Power:** End users including big corporate houses, businesses, schools, newspapers and individuals have varying degree of printing needs. Since businesses purchase high-end products, give bulk orders and have the financial muscle to bargain with printer manufacturers, we conclude that modestly high buyer power is present in this market. However, our target market is mainly individual end-users who employ printing for personal use. Although many options available to these consumers take the form of different brands and products, this group cannot command prices as successfully as corporate and business houses do. Also, retail users suffer from information asymmetry and a lack of collective bargaining power. Based on these observations, we conclude that buyer power in consumer segment is low.

**Supplier Power:** Cardboard and plastic parts made by injection molding are the main components of HP Olive. An established market already exists for these parts and there are a number of producers from which to choose. Also, the customization required particularly for Olive printer is minimal, so sourcing from different suppliers or even switching suppliers will not be very difficult.

**Post Consumer Waste:** The outer shell is composed of 100% recyclable pressed paper pulp made from recycled paper; the American Forest & Paper Association determined that 63.4 percent of the paper consumed in the U.S. was recovered for recycling in 2009\textsuperscript{xvi} making this readily available.

**Post Industrial Polypropylene, PET and High Density Starch:** The printer body, composed of polypropylene is infinitely recyclable and would be returned to the manufacturer after use. The cartridge would be made out of both PET and a starch-based shell. PET can be recycled via the consumer’s municipal waste services. “The amount of PET bottles recycled increased for the sixth straight year in 2008 to more than 1.45 billion pounds, catapulting the PET recycling rate to 27 percent, its highest level since 1997;” it is therefore readily available. Each of these three materials enhances the ‘cradle to cradle’ product lifecycle.

**Paper Industry:** “Paper is now a global industry, with multinational suppliers managing a complex web of fiber sourcing, pulping, paper production and converting operations all over the world.”\textsuperscript{xxi} We expect this resource is readily available and that there is an opportunity to use a larger percentage of post-consumer or post-industrial recycled material. Because of the availability of array of players in in-bound and out-bound supply chain, bargaining power of the suppliers is low.

**Substitutes:** Not only do consumers have different brands of printers serving as substitutes, but digital copies, online databases, memory cards, GPS systems and e-readers like Kindle are also substitutes for printing. Even the capacity of the human brain to memorize can be a potential substitute for printing. With the advent of the internet and computer technology, it has become easy to store and access huge amounts of data, which then reduces the need of physically printing documents. The substitutes however, do not provide the “sheer tactile pleasure”\textsuperscript{xxii} and convenience of holding a sheet of paper. HP Olive offers an environmentally-conscious alternative.

**Internet/Newspaper:**

U. S. daily newspapers deliver a total of 90.3 billion page impressions per month, print and online. The online share of these pages is only 3.5 percent — 96.5 percent of page impressions delivered by newspapers are in print.\textsuperscript{xxv}
In-Store Inkjet Refilling Service: From electronics-only retailers to big box discounters, consumers have unprecedented access to printer equipment and supplies. Both OfficeMax and Walgreens have recently launched their own in-store inkjet refilling service. Both companies are tapping into a market of consumers frustrated with the price of manufacturer-branded (OEM) refills. This service can cost a mere third of the price of one original manufacturer refill cartridge.

- **3rd Party Cartridges:** Many OEM and third-party (aftermarket) vendor cartridges leave a startling amount of ink unused when they read empty. In fact, some inkjet printers force users to replace black ink cartridges when the cartridge is nearly half full, according to PC World.

- **E-Readers:** "With respect to fossil fuels, water use and mineral consumption, the impact of one e-reader payback equals roughly 40 to 50 books. When it comes to global warming, though, it's 100 books; with human health consequences, it's somewhere in between."

### Barriers to Entry

For most printer manufacturers, it is not the printer that fetches profit; their revenue model relies on the subsequent ink cartridges that the consumer uses after installing the printers. Most printers do not allow installment of any other brands of ink cartridges than those of the original printer manufacturer. For these reasons, entering into this market is difficult.

### SUPPLY CHAIN AND MARKETING

**Production and Sourcing:** A traditional inkjet printer, like the HP Deskjet, is composed of nearly 170 components, sourced from numerous countries. The printer then requires an extensive combination of production techniques and transportation routes resulting in a high carbon footprint. Six different types of plastic are typically used in the production of these components.

#### Typical Single Function Printer: HP Deskjet D1520 = 170+ Parts

Since plastics are not biodegradable, most plastic components of discarded printers find their way to landfills and add to local or global environmental woes. Instead of using six different types of plastic polymer, HP Olive uses only polypropylene (PET) which is an infinitely recyclable polymer. This shift to a single polymer eases raw material sourcing and streamlines the production process. HP Olive’s outer shell is composed of 100% recyclable pressed paper pulp made from post-consumer recycled paper. Using paper encourages a cradle-to-cradle material recovery and also reduces the weight and cost of manufacturing the printer.

**Target Market:** According to a new survey by firms Landor Associates, Penn Schoen Berland and Burson-Marsteller, corporate social responsibility carries great weight in consumer purchasing decisions. "75% of consumers believe social responsibility is important, 55% would choose a product that supports a particular cause against similar products that don’t."

A 2010 survey of consumers between the ages of 14-54 determined that 'the green consumer' tends to be a man or woman aged 39 with children, a college degree and an average yearly income of $70,000. (See figure A) This segment of the market recognizes the value of sustainable solutions and is willing to pay a premium for access to green innovation.
Marketing Channels:
Because HP Olive will replace the typical desktop printer which is nearly ubiquitous in American households, the marketing strategy will be focused first on mass media advertising including network/cable television and newspaper/magazine print media. To promote via word-of-mouth and to tap into the fundamentally grassroots-oriented environmental conscious population, the HP Olive will be promoted through social media channels including Facebook and Twitter, as well as through sponsored reviews by enviro-blogs like treehugger.com. Also, co-branding with mass merchandisers and electronics retailers (i.e. Best Buy, Target, etc.) will help stretch marketing budgets while enhancing the partner’s brand equity as well. Point-of-purchase displays would feature the product. Coupons or promotions would accompany the product launch phase. Partnerships with non-governmental organizations like the Sierra Club could reinforce the environmental cause (i.e. one tree will be planted with each printer purchased).

Pricing Strategy:
The current market of 'single function printers' ranges from $32 to over $140. Due to HP Olive’s range of innovative features, the product would be priced at the higher-end of the market offerings at $110 to $120. We expect that the consumers within our target market would be willing to pay a higher price due to the eco-friendly qualities of the printer and the previous demographic research noting a $70,000 yearly income.

The other value proposition for customers is the multiple options for cost-savings. The options of using the disappearing ink will allow the consumer to utilize the same paper multiple times. Also, the printing option of using "reclaimed waste ink" will further reduce costs and improve the utility of the product. This is considerable savings compared to spending from $30 to $60 a month on ink for an average printer. While the consumer may believe the $40 printer is an economical option, in fact they will spend approximate $540 each year on ink as opposed to a mere $120 with the HP Olive.

Refinements and Development
The next phase of development will likely be the acquisition of a provisional patent. The concept will then be proposed to HP; the concept may be sold outright or an arrangement for an exclusive licensing agreement may be pursued.

While the HP Olive relies primarily upon existing processes, new technologies and systems will need to be established. HP’s commitment to open innovation will expedite this process by employing leading engineers and researchers to refine the proposed features.

• **Soy Based Ink:** It is recommended that HP acquire SoyJet, producer of SoyInk cartridges. HP would then design the HP Olive cartridges to ensure efficient use and preservation of the ink.

• **Disappearing Ink:** Additional research and development should be designated to refining the chemistry of the thymolphthalein-based ink for use in inkjet printers.

• **Material Sourcing:** Construction of the single material drive component of the HP Olive can be made from readily available and infinitely recyclable polypropylene. A source of high-density fiberboard, PET and high-density starch must be found; molds and production techniques must be refined for first-round prototypes.
• **Engineering:** Special consideration must be made during the design / engineering process with regard to the internal components of the HP Olive to support the concept of recycling and remanufacturing.

• **Full Product Lifecycle Support Systems:** To support the recycling and remanufacturing of components, HP’s existing recycling facilities and closed loop system must be expanded. HP Planet Partners Recycling Program should be expanded as well. Additional partnerships may be required.

• **Market Analysis:** Further research could help HP target the most profitable consumer segments.

**PRODUCT LINE EXTENSIONS AND REVENUE OPPORTUNITIES**

• **Auto Daily News Subscription Model:** Through a monthly subscription model, customers could receive customized news that would be sent to their Wi-Fi-connected HP Olive. The documents would print automatically at a pre-determined time and be ready for reading on-the-go. If this model were coupled with the disappearing ink concept, paper use could be dramatically reduced. The incentives for the newspaper company would be a reduction of 30% costs typically designated to distribution and production, as well as a significant percentage of their labor costs, which currently make up 50% of their total costs. This model could also apply to recipes (Food Network), children’s bedtime stories (Barnes and Noble) or homework exercises (Blackboard). Daily schedules or checklists could also be printed (Franklin Covey or iPhone).

• **Cartridge Subscription Model:** HP Olive consumers could subscribe to receive cartridges via mail.

• **Recycled Paper:** HP does not currently sell 100% recycled paper; this should be bundled with printer and available for sale separately.

• **License Disappearing Ink to Other Manufacturers / Industries:** The disappearing ink concept could be applied to newspapers or perishable food. As the food nears its expiration date the ink will fade.

• **Carbon Footprint Tracking Program:** Schools, colleges and small businesses could subscribe to receive a weekly report tracking their sustainability impact: pounds of SoyPrint toner used, pounds of heavy plastic recycled, number of reams of recycled paper consumed.

• **Inkless ‘Print/Erase’ Printer:** This concept would reference the Cradle to Cradle DuraBook format that features plastic-based paper instead of pulp-based paper. An existing prototype in Japan uses a special thermal head and plastic sheets to print and erase document. The special paper can be used up to 1,000 times. The unit currently costs over $5000 and $3 per sheet.

• **Copy Paper to Toilet Paper Machine:** This Japanese machine converts copy paper to toilet paper, a paper product that is in use in every home and office. This could be an innovative extension of HP’s paper/printer product line.
### THE SPECTRUM OF GREEN CONSUMERS

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<th>%</th>
<th>Attitude towards environmentally friendly apparel</th>
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<td>Very likely to seek; would be extremely bothered and complain.</td>
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<tr>
<td>Green</td>
<td>9</td>
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<tr>
<td>Light green</td>
<td>54</td>
<td>Somewhat or moderately likely to seek.</td>
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<td>Pale green</td>
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<td>Do not seek.</td>
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<tr>
<td>Non-green</td>
<td>16</td>
<td>Do not seek; would not be bothered.</td>
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### WHO ARE THE GREEN CONSUMERS?

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Figure A


