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HP Canada Co.: a circular supply chain for recycled plastic

Cole Beattie wrote this case under the supervision of Jury Gualandris and Deishin Lee solely to provide material for class discussion. The authors do not intend to illustrate either effective or ineffective handling of a managerial situation. The authors may have disguised certain names and other identifying information to protect confidentiality.

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It was June 2020, in the midst of the COVID-19 pandemic, and Frances Edmonds, head of sustainable impact at HP Canada Co., the Canadian subsidiary of HP Inc. (HP), was still getting used to working permanently from home. With over 20 years of experience in the environmental sustainability space and four years in her current role, Edmonds was continuing HP’s decades-long pursuit of sustainable impact (see Exhibit 1). HP had worked nearly two decades with strategic partners like Lavergne Groupe to redesign its products and make plastic circular. However, Edmonds was now focused on (a) developing a circular supply chain to ensure that HP’s recyclable products were recycled, (b) ensuring that those resources were put back into new products, and (c) creating demand for such products (see Exhibit 2).

Edmonds and her colleague, Dean Miller, the program manager for the closed-loop plastic recycling effort at HP worldwide, had just completed a virtual tour of the state-of-the-art plastics recycling facility of Lavergne Groupe, which was a key partner in HP’s circular supply chain. Led by Lavergne Groupe’s chief executive officer, Jean-Luc Lavergne, these virtual meetings were just one of the many ways that HP operations were changing to accommodate the constraints imposed by COVID-19, carrying the added benefit of avoiding emissions from travel. As Edmonds ended the Zoom meeting, she reflected on HP’s commercial and operational strategy and what the best option would be to increase the amount of recycled content in HP’s products. Having successfully developed product designs and process technologies that made end-of-life (EOL) plastic technically recyclable, HP was now committed to using 30 per cent post-consumer recycled (PCR) plastic across its personal systems and printers by 2025 (see Exhibit 3). To achieve this ambitious goal, the HP team needed to work on expanding the sourcing options for EOL plastic, supporting suppliers like Lavergne Groupe to improve the quality and efficiency of its recycling processes, and engaging with contract manufacturers and consumers to increase the acceptance and perceived value of PCR plastic and products that were made with it. However, decreasing commodity prices during the COVID-19 pandemic (such as virgin acrylonitrile butadiene styrene (ABS) resin hitting record lows of CA$1.15[[1]](#footnote-1) per kilogram), global supply challenges, and lowered global collection of recycled content could potentially undermine HP’s recycling efforts and goals (see Exhibit 4).

HP’s Sustainable History

Bill Hewlett and Dave Packard founded HP in 1939, five years after graduating from Stanford University with degrees in electrical engineering. They started the business out of a garage in Palo Alto, California, first designing audio oscillators for use in cinema, and then developing microwave and frequency sensor technology over the next two decades.

HP entered the printing industry through an acquisition in 1958 and subsequently grew this division into the largest printing business worldwide, shipping over 300 million ink cartridges in 2019 and accounting for 26.6 per cent of global printing hardware sales that year.[[2]](#footnote-2) With its lineup of ink-jet, laser, and multi-function printers for both office and home, HP sold 25.1 million units in 2019, earning a net revenue of $20.066 billion and earnings before interest, taxes, depreciation, and amortization (EBITDA) of $3.202 billion for its printing hardware division alone. Accounting for about 35 per cent of HP’s total revenues, the printing business was more profitable than personal systems, with EBITDA margins of 16 per cent in and 5 per cent, respectively.

HP had a strong presence in Canada; its workforce was a model for gender equity and diversity efforts,[[3]](#footnote-3) securing HP’s reputation in 2020 as one of Canada’s (a) best diversity employers, (b) greenest employers,[[4]](#footnote-4) and (c) most sustainable technology companies.[[5]](#footnote-5) HP was also actively engaged in a wide variety of external stakeholders in Canada, such as the Circular Innovation Council, Green Economy Canada, and L’Espace de concertation sur les pratiques d’approvisionnement responsable.[[6]](#footnote-6)

HP’s long-standing commitment to sustainability had its roots in product design, initially with the intent to improve business efficiency and reduce waste. This effort was formalized in 1992 with the launch of the Design for Environment (DfE) program. DfE bolstered demand for the HP Planet Partners program, which, a year earlier, had started collecting HP LaserJet print cartridges for recycling. As the scope of its impact widened, DfE was renamed Design for Sustainability to incorporate both environmental and social sustainability into product design. Complementing its sustainable design initiatives, HP increased its EOL plastic collection infrastructure over time. In 2020, the company was able to collect a variety of plastics including plastics from post-consumer electronics waste (e-waste) and ocean-bound plastics (see Exhibit 2).[[7]](#footnote-7) HP also leveraged life-cycle assessment to increase its own use of recycled content in its expanding product portfolio.

HP decided to focus its recycling efforts on sourcing EOL plastics, rather than post-industrial plastics scraps, due to their abundance as well as to avoid incentivizing industrial inefficiencies. Along the journey to develop a circular supply chain for EOL plastic, HP offered incentives to retailers to improve the efficiency of their collection infrastructures. HP also offered guidance to regulators on effective extended producer responsibility (EPR) frameworks. The company supported compounders, recyclers, and resin suppliers in innovation efforts focused on developing new equipment that could improve cost, quality, and yields, and HP organized pilots involving contract manufacturers to legitimize the use of PCR resins in their production processes. To stimulate circular procurement, HP engaged diverse customers and the Canadian Council of Ministers of the Environment.[[8]](#footnote-8)

Recycling Plastics—Challenges

As of 2020, plastics were the largest type of non-biodegradable waste on the planet. The presence of plastics degraded ecosystems across the globe. Although recycling technology and markets for recycled metals, glass, and paper developed consistently, the growth and variety of plastic products hindered similar progress for plastic material.

Compared to recycling metal, recycling plastic was more challenging along several dimensions. Plastic was inherently a lower-value material than metal, and EOL plastics streams were highly contaminated from both the variety of plastics and exposure to organic and non-organic materials (see Exhibit 5). Both types of contamination necessitated sophisticated and costly sorting methods. Moreover, some types of EOL plastic were more valuable than others (see Exhibit 5). The most desirable and recyclable plastics for HP ink-jet supplies were polyethylene terephthalate (PET) and high-density polyethylene. More broadly, ABS and high-impact polystyrene (HIPS) were the most common target plastics from e-waste from small domestic appliances (see Exhibit 6). Other plastics such as polypropylene (PP), polystyrene, and low-density polyethylene were harder to recycle and thus less valuable.

Typically, the highest-quality plastic to recycle came from post-industrial waste that had been produced in a controlled manufacturing environment. Lower-quality plastic to recycle came from post-consumer and ocean-bound sources; these tended to have higher amounts of contaminants. Thus, Lavergne Groupe—and HP, as a consequence—either paid higher prices for EOL plastics that were pre-sorted and purified, or invested heavily in technology allowing them to screen and sort the plastic to a grade suitable for the production of high-quality PCR plastic resin.

Until recently, the highly contaminated EOL plastic streams sourced in Canada through provincial EPR programs were either shipped to developing countries, where lower labour costs and less stringent environmental regulations allowed local recyclers to pay higher prices for Canadian EOL plastic, or were sent for energy recovery. This compromised the ability of Canadian-based recyclers such as Lavergne Groupe to source EOL plastic locally. Moreover, exporting EOL plastics could impose a high cost on the natural environment and society. For example, exported Canadian EOL plastic could be burned to extract highly valuable contaminants (metals) and produce energy, but doing so would potentially emit harmful pollutants.[[9]](#footnote-9)

Using PCR plastic resin in HP products

The HP Planet Partners return program was launched in 1991 to divert exhausted HP printer cartridges from landfill by collecting them worldwide through multiple channels, including in-person drop-off, by mail, and scheduled pickups. At the beginning, collected HP printer cartridges were recycled into low-value applications such as wire spools and cafe trays. Soon after, due to low demand for the recovered EOL plastic, HP began to investigate how to use EOL plastic in original HP products. In 2002, HP began to work with Lavergne Groupe to develop PCR plastic resin from the steady stream of EOL plastic coming from its Planet Partners return program. Over $1 million was initially invested by HP and Lavergne Groupe to develop a novel design for HP ink cartridge disassembly. This investment started to pay back in 2005 when HP began to use PET PCR plastic in its original ink cartridges.

Based on the initial success with closed-loop PCR plastic in HP original ink cartridges, HP began exploring the more complicated issue of developing higher-quality PCR plastic resin for printers and personal systems. A typical printer was composed of 84 per cent HIPS and 10 per cent ABS, and both materials had accessible PCR plastic resin markets (see Exhibit 6). In 2015, HP successfully introduced PCR plastic in its printers and personal systems products. By 2019, HP had expanded its adoption of PCR resins to the point that it accounted for 9 per cent of the total weight of plastic resins used in its products (see Exhibit 7). HP had a goal of bringing this figure to 30 per cent by 2025 in an effort to move toward a more circular economy. This effort included the development of products like the Tango Terra, HP’s first certified carbon-neutral home printing system. One of the main requirements to ensure carbon neutrality was for the product to contain 30 per cent recycled plastic, which was in line with HP’s current goals.

Lavergne Groupe

Jean-Luc Lavergne founded Lavergne Groupe in 1984 with the goal of transforming EOL plastic into high-quality and price-competitive PCR plastic resins to be used in a variety of products. Lavergne Groupe first supported HP with the development of a drop-in replacement for PET used in HP ink-jet cartridges, using a combination of HP-recovered PET and municipally recycled PET water bottles. After three years of development and iteration, which involved experimenting and prototyping different recipes to optimize moulding and manufacturing requirements, in 2005, HP began using the PET PCR plastic resin in LaserJet toner cartridges in only one manufacturing location. Over the next six years, the effort expanded to multiple manufacturing locations and, in 2011, included additional PCR plastic resins involving PP plastic. In addition to providing resin formulation expertise, Lavergne Groupe collaborated with HP to develop key technology to efficiently deconstruct and recycle HP’s printer cartridges, dramatically improving the yields and quality of HP’s production process over time.

When HP began exploring PCR for print hardware in 2013, Lavergne Groupe was again a critical partner in the effort. Lavergne Groupe and HP invested $3 million to experiment with innovative hardware disassembly and recycling strategies and to investigate new developments in emerging process technologies. Over approximately three years, the effort advanced from extracting plastic from discrete, sorted product streams to being able to sort plastic collected from complicated and diverse product streams such as e-waste from small domestic appliances. Between 2015 and 2017, at a cost of over $10 million, Lavergne Groupe expanded its production process to include novel shredding, cleaning, and screening technologies as a necessary approach to improving quality, purity, and yield of feedstock for their PCR resin compounding business. This enabled Lavergne Groupe to produce an entire portfolio of PCR plastic resins that were competitive in price and quality but still met HP’s rigorous performance specifications.

Lavergne Groupe was based in Montreal but expanded its operations in 2010 by opening a facility in Vietnam. With the majority of its customers residing in Southeast Asia, Laverne’s proximity to its Southeast Asian customers allowed the company to benefit from lower lead times. Lavergne Groupe could also take advantage of the developing informal economies for EOL plastics in Southeast Asia. In 2020, Lavergne Groupe began developing plans for expansion in Belgium and Singapore, with plants of similar technology and capacity. Given the critical importance of limiting costs associated with inbound logistics and shipping PCR resins to customers, Lavergne Groupe was recognizing the possible benefits of multiple regional solutions.

Lavergne Groupe sourced EOL plastic from HP and retailers such as Best Buy Co. Inc. (Best Buy) who offered e-waste streams. Unlike many other plastics recyclers, Lavergne Groupe was able to compete on quality with virgin plastic producers as a result of its proprietary sorting technology, which allowed Lavergne Groupe to offer HP an environmental edge. Moreover, the stable price of Lavergne Groupe’s PCR plastic resins could provide a source of competitive advantage for HP, especially in light of the high volatility of virgin plastic prices (see Exhibit 4). While the price of virgin plastic was directly correlated with the global price of oil, EOL plastic and PCR plastic resins did not show any significant correlation with oil prices. The price to acquire EOL plastic depended mainly on the collection infrastructure in place and associated logistics, and could be locked in for over two years. Lavergne Groupe’s procurement was committed to identifying and securing new stable streams of high-quality EOL plastic supply, including closed-loop EOL plastic collected by HP. Moreover, Lavergne Groupe’s production process was highly automated and well optimized, and continuous efforts to innovate screening, purifying, and blending technologies opened opportunities to expand and diversify supply over time. Expanding procurement and production capabilities, in turn, allowed the company to produce PCR plastic resins that were cost competitive, at worst, and provided cost savings, on average, to its customers (see Exhibit 4).

Lavergne Groupe—Processing EOL Plastic

Lavergne Groupe’s production process was highly automated and worked around the clock seven days a week, except for regular maintenance that required halting operations for two to three hours every day. Lavergne Groupe specialized in processing e-waste, which typically contained a far higher level of contaminants compared to other EOL plastic sources. The first step in its production process was to shred the bales of e-waste into uniform pieces at a maximum capacity of 3,000 kilograms (kg) per hour. This first step also removed metals and other heavy contaminants, representing, on average, 1.5 per cent of the total intake of EOL plastic. Once properly shredded, the resulting plastic was sent through various sink baths to screen out ferrous and non-ferrous contaminants as well as clean and separate the various types of plastic. This step, called flotation, could work at a capacity of 3,000 kg per hour and helped to remove additional contaminants (approximately 15 per cent of the total intake), the majority of which constituted e-waste plastic containing chemicals that were once considered essential (e.g., flame retardants) but had since been banned. Most consumers kept their electronics products for years before disposing of them, and the introduction of new regulations for hazardous materials such as brominated flame retardant could sometimes reduce products’ recyclability.

Next, the material was centrifuged and heated to dry the plastic. Further separation of the target plastics was achieved using electrostatic technology. This automated polymer screening and sorting step had a maximum capacity of 3,000 kg of pre-sorted EOL plastic per hour and created four clean, discrete streams of target EOL plastics while also removing an additional 6.5 per cent of contaminants. Additionally, Lavergne Groupe investigated the colour sortation of segregated plastics, as it could dramatically increase the palette of possible product colours for PCR resin.

Once EOL plastic had been filtered and purified, it was then sent to one of the 16 blending silos, each with a storage capacity of 120 metric tons. A typical e-waste stream could be sorted into four different types of EOL plastic, which needed to be homogenized and blended (with the addition of certified chemical additives) in one of the 16 silos. Each silo ultimately offered a different blend of plastic, allowing Lavergne Groupe to remain flexible in procurement while meeting a wide range of customer demands for diverse types of PCR plastic resin. Because of the large storage capacity of each silo, it took 12 hours to fill, homogenize, and blend a single batch of PCR plastic resin. The blending capability and capacity of these particular silos was critical to creating large-scale homogenous batches of PCR plastic. This was a critical consideration for PCR plastic because unblended materials, or materials only blended in small lots, could cause the moulder (i.e., contract manufacturer) to constantly need to tweak processes to maintain quality and yields. This increased the cost of producing product and was not a problem typically encountered with virgin materials.

The final production step was the extrusion of specific blends of PCR plastic resin. This extrusion process could operate at a capacity of 2,000 kg per hour and had an average production waste of 2 per cent.

The quality of the incoming feedstock of EOL plastic was the most important determinant of the cost of this relatively complex production process. The contamination level of each bale of EOL plastic brought into the facility affected the yield (the amount of recycled plastic resin produced from a bale of plastic) and processing cost. Many types of EOL plastic found in the baled feedstock were unacceptable to manufacturers because of low quality or toxicity concerns. These plastics were filtered out in the process and either landfilled or incinerated. Therefore, a key success factor was the ability to procure high-quality feedstock of EOL plastic from reliable sources. However, Lavergne Groupe discovered that there were few reliable suppliers of baled EOL plastic. EOL plastics were typically sourced from metal recyclers’ waste piles. Unfortunately, metal recyclers had little incentive and little interest to sort through their waste streams to improve the quality of EOL plastic. This was fundamentally due to weak domestic demand for end products containing recycled content. In effect, procurement was the first step in the sorting process, as the source of the plastic dictated the type of treatment the EOL plastic would receive.

Lavergne Groupe—Sourcing EOL plastic

Lavergne Groupe’s Montreal plant sourced 95 per cent of its EOL plastic feedstock from e-waste. Of this, 50 per cent was sourced from the United States, 35 per cent from Europe, and only 15 per cent from Canada. Canada produced much lower volumes of EOL plastic, covered larger geographical distances, and had more heterogenous regulations across jurisdictions. However, Lavergne Groupe was working with Canadian material recovery suppliers to help justify additional investments in sink floats and other sorting and cleaning technologies that could remove unwanted plastics, lower shipping cost, and raise yields.

Sourcing E-Waste EOL Plastic from HP Planet Partners Return Program

As of 2019, over 830 million printer cartridges had been collected from 76 countries through the HP Planet Partners return program, and many of these had been processed by Lavergne Groupe into PCR plastic resin.

In 2012, Walmart US joined the Planet Partners program with the first multi-brand take-back program, greatly expanding past volumes from HP products. In 2013, HP introduced HP Instant Ink, a subscription-based service that leveraged the Internet of things to reduce the environmental footprint of each printer cartridge administered through the program, relative to a non-subscription purchase of the same HP ink cartridge. It was estimated that, compared to a traditional transactional sale, HP Instant Ink helped customers to save up to 50 per cent on ink and reduce energy use by 86 per cent.[[10]](#footnote-10) HP Instant Ink also decreased the carbon footprint associated with each ink cartridge by 84 per cent. This reduction was achieved by avoiding customer trips to retail stores as well as by facilitating the collection of exhausted cartridges (through the inclusion of a postage-paid recycling bag in the box), which were then appropriately recycled instead of ending up in garbage bins and landfills.

As subscription-based products became more widely accepted, HP moved other products to the device-as-a-service (DaaS) model in the hopes of capturing greater economic value and improving environmental sustainability. With DaaS, HP retained ownership of the devices and could extend product life, optimize product usage, reduce transportation, and improve recycling. It was estimated that, compared to the traditional transactional sale of a commercial personal computer, DaaS reduced greenhouse gas emissions by 25 per cent and improved resource efficiency by 28 per cent.[[11]](#footnote-11)

Sourcing E-Waste EOL Plastic from Retailers

HP played a large part in facilitating the necessary collection infrastructure at retailers and at commercial technology providers with the establishment of the Planet Partners program. Although the COVID-19 pandemic in 2020 hampered supply chains and lowered the collection of recycled content globally, collection of e-waste was still expected to grow by 4.9 per cent a year over the next five years as the electronics industry gradually took more responsibility for the waste created by its products.[[12]](#footnote-12) Additionally, high product turnover rates in the consumer electronics market resulted in an ample supply of e-waste. Thus, e-waste from US retailers such as Best Buy gradually became a key source of feedstock for Lavergne Groupe and could easily continue to grow.

Sourcing Ocean-Bound Plastic from Haiti

In 2016, with the support of HP, Lavergne Groupe partnered with the First Mile Coalition (FMC) in growing the source of ocean-bound PET bottles collected through the informal economy in Haiti. Although Lavergne Groupe already had long-term contracts in place for a majority of its recycled PET needs, the company joined HP in the Haiti effort when it saw how the program could improve the lives of plastics collectors and their families in Haiti. HP, Lavergne Groupe, and FMC were targeting plastics referred to as ocean-bound plastics—or plastics found within 50 kilometres of the shoreline in countries without a waste management infrastructure, where there was high likelihood that the plastic would end up in the ocean. This not only secured a promising source of PET for Lavergne Groupe but also enabled HP to introduce ocean-bound plastics into HP products, greatly improving their environmental and social impact.

Using Haiti’s informal economy of waste picking, the FMC started collecting clear PET bottles for use in the fashion industry by such brands as Timberland. By adding the processing capabilities of Lavergne Groupe and HP’s use of PCR plastic resin in electronics, the feasible types of PET bottles for recycling expanded from colourless to include red, grey, and brown PET bottles. This new demand for a wider variety of plastic boosted the informal economy in Haiti and increased the social impact of HP’s circular supply chain. HP and Lavergne Groupe also committed to a minimum monthly purchase to ensure that collectors could rely on consistent demand and regular payments, as this was critical to improving their lives.

To solidify their sustainable relationship with material recovery suppliers in Haiti, and to reduce logistics costs in sourcing the ocean-bound PET, in 2019, HP and Lavergne Groupe jointly invested in a $3.5 million wash line, which effectively made the product ready for immediate processing in Montreal. Moreover, HP and Lavergne Groupe supported the informal economy by investing approximately $150,000 in small businesses, boosting the development of the collection network of ocean-bound PET plastic on the island.

Furthering their presence in Haiti allowed for the creation of more than 1,100 stable jobs in the collection network.[[13]](#footnote-13) As a result of HP donations to FMC and the collector communities, and with the creation of more stable jobs, 150 children from collector families were able to return to school. In June 2020, when demand for the ocean-bound PET plastic plummeted due to COVID-19, HP and Lavergne Groupe offered additional assistance by pre-purchasing four months’ worth of supply in order to prevent layoffs within the Haitian informal economy. From an environmental and economic standpoint, the new wash line eliminated most contaminants from the ocean-bound PET plastic as well as a downstream processing node. This lowered the overall shipping weight and, therefore, reduced the cost and emissions of transporting material to Montreal.

With its PET recycling program, HP helped to divert from landfills an average of one million PET bottles per day.[[14]](#footnote-14) In 2019, about 10 per cent of those PET bottles were sourced from Haiti, with the percentage expected to increase in the coming years. PET bottles from Haiti were used in Lavergne Groupe’s production of resin for use in HP products, accounting for 5 per cent of the total intake of EOL plastic feedstock at the Montreal facility. PCR plastic resin containing ocean-bound PET plastic was not well suited for plastics used for printer case parts. ABS and HIPS plastic resins tended to be used as case plastics because of their impact strength and gloss characteristics. However, ocean-bound PET plastic was being considered in a variety of other internal printer applications.

HP Contract Manufacturers—From Virgin Plastic Resin to PCR Plastic Resin

HP used a concentrated supply base of Asian contract manufacturers to make its products. The production of HP’s personal computer hardware was contracted and coordinated through a competitive bid system where contract manufacturers were given freedom to choose their own suppliers of raw materials and subcomponents as long as HP’s product specifications and quality criteria were ultimately met. In contrast, the production of printers and cartridges was managed through “guided” production whereby HP retained more control over the supply decisions made by each contract manufacturer.

Since 2005, with the support of Lavergne Groupe and its PCR specialists, HP engineers assisted their contract manufacturers in adapting their production lines to use PCR plastic resins. HP began with cartridge manufacturers and then moved to printer manufacturers in 2015.

For contract manufacturers, sourcing from Lavergne Groupe meant that long-standing relationships with suppliers of virgin plastic resin could be compromised. Moreover, when PCR plastic resin was first introduced in the early 2000s, standard manufacturing techniques were not properly tailored to these new materials, and the production process was rife with quality concerns and inefficiency. Plastic injection moulding involved extremely technical operations, with fine-tuned adjustments required for each kind of plastic resin. Consequently, contract manufacturers were concerned that the introduction of PCR plastic resin would require extensive retooling and possibly cause frequent disruptions to their operations, as quality variability was perceived to be higher for PCR than for virgin resin. Furthermore, there were health and safety concerns related to the use of PCR plastic resin. There was fear that if the EOL plastic used to make the PCR plastic resin was not screened properly, banned toxic polymers could create noxious fumes during production.

From 2002 to 2020, Lavergne Groupe and HP continued innovation in all aspects of PCR materials[[15]](#footnote-15) to the point that Lavergne Groupe’s PCR resin offerings could perform as a drop-in replacement for virgin resin, requiring the same amount of set-up as any new virgin resin. Although the integration took some time, the introduction of PCR resin by contract manufacturers operating under the guided production model ultimately worked well for HP. However, to meet its goals of increasing the amount of recycled content across its product lines, HP needed to develop a strategy to convince more contract manufacturers to adopt PCR resin. While HP could add the inclusion of recycled content as a criterion in their request for bids from contract manufacturers, it was still unclear how contract manufacturers for personal computers and other personal systems would react.

HP’s Consumers and Business Customers

Edmonds was examining the purchasing behaviour of consumers and business customers and whether sustainability leadership in Canada came at a competitive disadvantage for HP. Although proposed regulatory amendments[[16]](#footnote-16) could support HP’s recycling efforts in Canada, as of 2020, importers of counterfeit printer cartridges were not subject to local tax laws, take-back programs, or stewardship fees, contributing to the price differential with original HP printer cartridges. Moreover, counterfeit printer cartridges did not contain PCR plastic and also contained undesirable chemicals that could expose users to indoor air quality issues.[[17]](#footnote-17)

Unfortunately, the purchasing decisions of government and business customers were driven by price. Research showed that 88 per cent of requests for proposal issued by Canadian governments, which overall accounted for about 13 per cent of Canada’s gross domestic product and had a large economic footprint in the national electronics industry, disregarded environmental and social sustainability as independent selection criteria.[[18]](#footnote-18) Direct interaction between Edmonds and many business customers suggested that the introduction of environmental and social criteria in their procurement process could, in certain purchasing categories, lead to a reduction in sourcing options and hence a perception of overreliance on individual suppliers.[[19]](#footnote-19)

Calls to Action

After a successful 2019, HP’s progress toward its sustainability goals could see a major setback due to the COVID-19 pandemic in 2020. Edmonds was considering possible strategic, tactical, and operational actions to cope with the situation and sustain HP’s aspirations. Would HP’s circular supply chain remain viable and competitive? Where could additional efficiencies be found? How could customer demand for recycled plastic be stimulated? Were the potential environmental and social gains worth the effort?

The Ivey Business School gratefully acknowledges the generous support of the RBC Foundation in the development of this case.

Exhibit 1: TImeline of HP’s continued commitment to recycled plastic

**1991**: HP Planet Partners program. EOL plastic from ink supplies diverted from landfills into low-value items.

**2002**: $1 million investment with Lavergne Groupe to redesign ink cartridge disassembly to make plastic circular.

**2005**: PCR plastic resin from EOL ink cartridges and PET bottles used in one ink cartridge family in one manufacturing location.

**2010**: $10 million investment by Lavergne Groupe in new facility in Vietnam.

**2011**: PCR plastic resin containing PP used in ink cartridges.

**2013**: Instant Ink program.

**2013–2015**: $3 million investment into piloting innovative hardware disassembly and recycling strategies as well as emerging process technologies.

**2015–2017**: $10 million investment in expanding its production capability to improve production yields, quality, and variety.

**2015:** PCR plastic resin used for the first time in HP products.

**2016**: Lavergne Groupe joined HP in Haiti; soon after, ocean-bound PET plastic was included in the formulation of a novel PCR plastic resin.

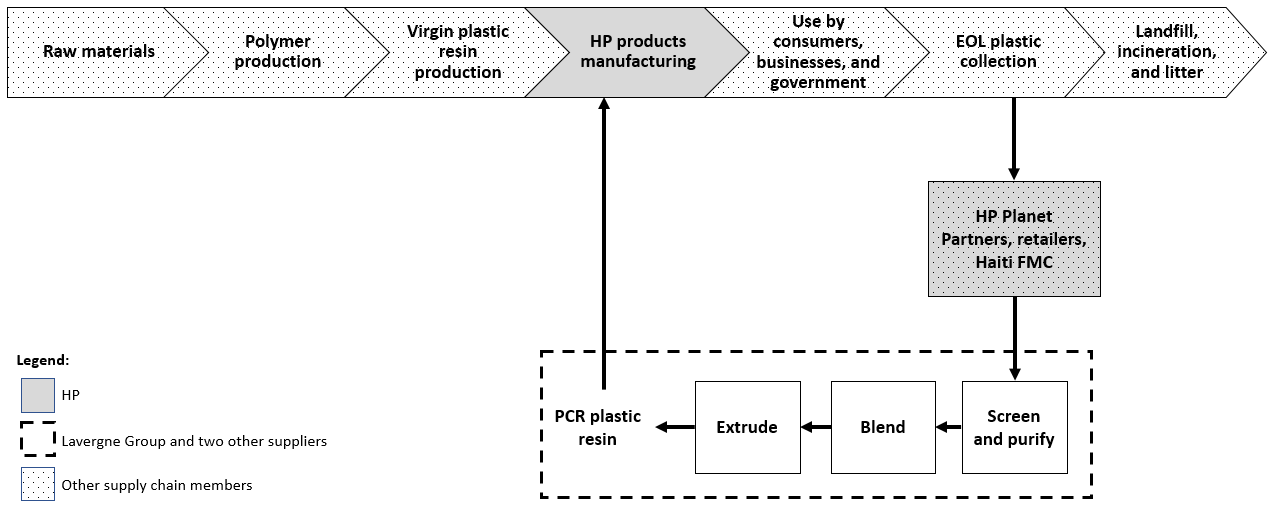
**2019**: $3.5 million investment by HP and Lavergne Groupe in a new washing line in Haiti.

**2020**: Unexpected market shifts threatened the competitiveness of HP’s circular supply chain.

Note: All dollar amounts are in Canadian dollars; HP = HP Inc.; EOL = end of life; PCR = post-consumer recycled; PET = polyethylene terephthalate; PP = polypropylene.

Source: Prepared by the case authors based on information provided by HP Canada Co. and Lavergne Groupe.

Exhibit 2: HP’s circular supply chain



Note: HP = HP Inc.; EOL = end of life; FMC = First Mile Coalition; PCR = post-consumer recycled.

Source: Prepared by the case authors based on information provided by HP Canada Co. and Lavergne Groupe.

Exhibit 3: Sustainable Impact Goals for HP Products and Services

|  |  |  |
| --- | --- | --- |
| Goal | Progress in 2019 | United Nations Sustainable Development Goals |
| Use 30% PCR plastic across HP’s personal systems and print product portfolio by 2025. | During 2019, HP used 25,560 metric tons of PCR plastic in HP personal systems and print products, equivalent to 9% of total plastic used. | 12 and 14 |
| Reduce single-use plastic packaging by 75% by 2025 (compared to 2018). | Throughout 2019, HP achieved a 5% reduction. | 12 and 14 |
| Reduce GHG emissions intensity of HP products during operational lifetime by 30% by 2025 (compared to 2015). | Through to the end of 2019, HP achieved an 18% decrease. | 7, 12, and 13 |
| From 2016 to 2025, recycle 1.2 million metric tons of hardware and supplies. | By the end of 2019, HP had recycled 528,300 metric tons of hardware and supplies. | 12 |

Note: HP = HP Inc.; PCR = post-consumer recycled; GHG = greenhouse gas.

Source: Prepared by the case authors based on HP Inc., *Sustainable Impact Report 2019*, accessed November 5, 2020, https://h20195.www2.hp.com/v2/getpdf.aspx/c06601778.pdf.

Exhibit 4: Short- and Long-term volatility of virgin plastic resin and PCR plastic resin



Note: All dollar amounts are in Canadian dollars; kg = kilogram; PCR = post-consumer recycled; ABS = acrylonitrile butadiene styrene; HIPS = high-impact polystyrene; the price PCR from Lavergne is $1.85/kg, as indicated in the graph.

Source: Prepared by the case authors based on information provided by HP Canada Co. and Lavergne Group; Jimmy Zhang, “PS Producers Enjoy High Margins,” *ICIS Chemical Business* 298, no. 13 (October 2–8, 2020): 1–16.

Exhibit 5: Market value of different types of EOL plastic and other recycled materials

|  |  |  |  |
| --- | --- | --- | --- |
| Recycled Material | Value | Price, 2018–2019 | Common Product Examples |
| Aluminum | High | $1.33/kg | Beverage cans |
| HDPE bales | Medium | $0.90/kg | Milk jugs, laundry detergent bottles |
| PET bales | Medium | $0.33/kg | Water bottles, soda bottles |
| Corrugated cardboard | Low | $0.08/kg | Gift packaging, floor protectors for painting |
| Mixed paper | Low | $0.005/kg | Printing paper |

Note: All dollar amounts are in Canadian dollars; EOL = end of life; HDPE = high-density polyethylene; PET = polyethylene terephthalate; kg = kilogram.

Source: Prepared by the case authors based on Xavier Cronin, *Recycled Plastics Prices in 2019 & 2020 Look Ahead*, accessed November 5, 2020, https://info.opisnet.com/hubfs/PCW/Content/Recycled\_Plastics\_Outlook\_v6.pdf?utm\_campaign=%5BSpot%5D%20PCW%20Recycled%20Plastics%20Weekly%202020&utm\_medium=email&\_hsmi=83719637&\_hsenc=p2ANqtz--wpGZ8-eUDy4gIi7xY2U5siu-7l63BCCJ6LSE\_HX2UsxA40k1xIM1vA9e3MGDkdoo07pdP-CsWm9bKq3dFohu5TtQ0pw&utm\_content=83719637&utm\_source=hs\_automation.

Exhibit 6: Plastic breakdown and cost incidence for a representative Home and Office HP printer with total internal cost of $40

|  |  |  |  |
| --- | --- | --- | --- |
| **Plastic Type** | **Percentage of Total Plastic** | **Cost ($/kg)** | |
| **Minimum** | **Maximum** |
| HIPS | 84 | 1.40 | 2.00 |
| ABS | 10 | 1.55 | 2.90 |
| Miscellaneous plastics | 6 | 1.55 | 2.90 |
| Total | 100\* |  |  |

Note: \*The printer contained an average total of 4 kg of plastic; All dollar amounts are in Canadian dollars; HP = HP Inc.; kg = kilogram; HIPS = high-impact polystyrene; ABS = acrylonitrile butadiene styrene.

Source: Prepared by the case authors based on information provided by HP Canada Co.

Exhibit 7: PCR plastic resin penetration in HP’s product portfolio

(Metric tons of PCR Plastic resin)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Product Type | 2015 | 2016 | 2017 | 2018 | 2019 |
| Personal systems | N/A | N/A | 8,080 | 8,360 | 9,650 |
| Home and office printers | N/A | N/A | 1,260 | 4,790 | 6,760 |
| HP ink cartridges | 6,282 | 5,517 | 5,901 | 5,354 | 5,384 |
| HP toner cartridges | 2,437 | 3,493 | 2,921 | 2,746 | 3,565 |
| Large-format printers | N/A | N/A | N/A | N/A | 200 |
| Total |  |  | **18,160\*** | **21,250** | **25,560\*†** |

Note: \*Does not add up exactly due to rounding; † Accounts for 9% of the total weight of plastic used in HP products in 2019; HP = HP Inc.

Source: Prepared by the case authors based on HP Inc., *Sustainable Impact Report 2019*, accessed November 5, 2020, https://h20195.www2.hp.com/v2/getpdf.aspx/c06601778.pdf.

1. All dollar amounts are in Canadian dollars. [↑](#footnote-ref-1)
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3. Yasmin Ranade, “Women in Tech Leader, Mary Ann Yule,” WhatsYourTech.ca, April 24, 2020, accessed November 4, 2020, https://whatsyourtech.ca/2020/04/24/women-in-tech-leader-mary-ann-yule/. [↑](#footnote-ref-3)
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7. “Recycled Content Validation,” UL, accessed May 18, 2020, https://www.ul.com/services/recycled-content-validation. [↑](#footnote-ref-7)
8. The European Commission defined circular procurement as green procurement that paid special attention to the purchase of works, goods, or services that contributed to the closed energy and material loops within supply chains while minimizing and, in the best case, avoiding negative environmental impacts and waste creation across the whole life cycle. “Public Procurement for a Circular Economy: Good Practice and Guidance,” European Commission, accessed January 23, 2021, https://ec.europa.eu/environment/gpp/circular\_procurement\_en.htm. [↑](#footnote-ref-8)
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13. HP Inc., “HP Accelerates Drive to Reduce Ocean Plastics with Expanded Planet Partners Program,” Global Newswire, October 21, 2020, accessed November 4, 2020, www.globenewswire.com/news-release/2020/10/21/2111943/0/en/HP-Accelerates-Drive-to-Reduce-Ocean-Plastics-with-Expanded-Planet-Partners-Program.html. [↑](#footnote-ref-13)
14. Ellen Jackowski, *Closing the Loop with Ocean-Bound Plastics from Haiti | HP Inc.* (Sustainable Purchasing Leadership Council, July 2019). [↑](#footnote-ref-14)
15. Innovations included improved (a) blending, (b) contaminant removal from incoming feed streams, (c) reactive compounding and additives, and (d) segregation (both material and colour). [↑](#footnote-ref-15)
16. The amendments proposed in summer 2020 by the Ontario government would capture out-of-province retailers that used e-commerce to supply materials accepted by the blue box to the Ontario market. However, the list of materials accepted by the blue box program did not include printer cartridges. “A Proposed Regulation, and Proposed Regulatory Amendments, to Make Producers Responsible for Operating Blue Box Programs,” *Environmental Registry of Ontario*, October 19, 2020, accessed January 19, 2021, https://ero.ontario.ca/notice/019-2579. [↑](#footnote-ref-16)
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19. An example of such a criterion was the newly developed ocean-bound plastic certification developed by UL in collaboration with HP. “Recycled Content Validation,” op. cit. [“Recycled Content Validation,” UL, accessed May 18, 2020, https://www.ul.com/services/recycled-content-validation.] [↑](#footnote-ref-19)