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The Good Side of Double-Sided Printing

Introduction:

Printing policies have become an important part of educational institutions in the past few years. The rise in internet communication and use has caused printing usage to increase dramatically. However, new duplex technology has also allowed printing to become cheaper and more efficient. Most colleges and universities in the United States have instituted policies that limit the amount of free printing that a student can print and these policies have proved somewhat effective in reducing the amount of waste. However, Wellesley College does not currently have any policy on printing or the purchase of printers, and thus our paper will address the issue of whether Wellesley should institute a new printing policy.

Printing on campus has risen dramatically in the past few years due to increased internet use and also the introduction of e-Reserves about four years ago. To combat the enormous paper usage, the administration started buying duplex trays for all new printers starting in 2003. However, the use of e-Reserves caused it to be difficult to quantify the exact reductions in paper usage due to the duplex trays. As more courses began using e-Reserves, more students began printing long articles from the internet instead of going to the library to borrow books. While these issues complicate the use of printing and paper at Wellesley, it is still important to try to reduce paper consumption.

An effective paper usage reduction and double-sided printing policy is necessary in view of increasing printing usage. The primary paper waste on campus is caused by single-sided printing. The simplest way to cut paper waste is to set all of the printer

defaults to duplex printing. Although there are already duplex printers in the most heavily-used areas, it is necessary to establish duplex printing in all printers on campus. Thus, our proposal aims to reduce paper consumption through increasing the availability of duplex printers. This can be achieved by installing duplex trays in printers in residence halls and current offices that currently do not have a duplex option.

Background:

Wellesley College, like most colleges and universities in the United States, consumes a tremendous amount of paper every year. This consumption is due to student, faculty, and staff printing. Students often print out their class notes, assignments, and also e-Reserve readings for their classes. Faculties often use printers for class handouts and exams. There is also a tremendous amount of paper that the college uses for various other reasons, such as mailings and notices to the students. This enormous paper usage amounts to almost 13.2 million sheets of paper per year at a cost of over \$60,000.

Wellesley College not only has no clear policy to combat this paper use, but also provides no incentives for student, faculty, or staff to reduce their printing.

Two years ago, Wellesley College started buying duplex trays for all new printers that were compatible with duplex trays. Wellesley purchases about 50 to 75 printers per year; however, this number includes both heavy-volume public printers and small personal printers. There are currently around 237 heavy-volume printers on campus, 90 of which have duplex trays. Printers last for around three to five years depending on use, and while a heavily-used printer in the library may only last for two years, a seldom-used printer in a smaller department may last for seven years or more.

Computer labs, libraries, and other heavily used areas often already have duplex printers, and printer default settings on every computer are set to duplex printing. However, there are several places that lack printers capable of duplex printing. For example, the residence halls have old printers that cannot print double-sided pages. This prevents students from choosing duplex printing and reducing paper usage even when they would like to. In addition, many facilities do not have duplex printers in their offices. The lack of available duplex printers leads to unnecessary paper usage and thus, unnecessary paper waste. While simple, increasing campus-wide availability of duplex printing would be an easy and effective way to reduce usage.

Wellesley College currently purchases six different types of paper from Office Depot. The price of each type of paper is different, but the average cost of one ream of 500 sheets is around \$2.80. The college purchases paper by the case, with each case containing ten reams each. In 2004, Wellesley purchased 2641 cases of paper at a total cost of over \$66,000. In 2005, Wellesley purchased 2401 cases of paper at a total cost of over \$60,000. This decrease in paper consumption indicates a positive effect of the purchase of duplex printers. As old single-sided printers are gradually replaced with duplex printers, paper consumption should decrease. This reduction is also surprising when one considers the fact that printing has increased due to internet use and the popularity of e-Reserves.

The basis weight of all six types of paper is 20 pounds, which translates to 5 pounds per ream. Using the average cost of \$2.80 per ream, we calculate that one pound of paper costs \$0.56. While this cost seems relatively cheap compared to the enormous

costs of buying duplex trays and printers, it does not reflect all the social and environmental costs of the paper.

“The American Paper Institute has estimated that manufacturing one pound of office paper from virgin fiber consumes the following resources: 12 cubic inches of pulpwood, 13.5 gallons of water, 10.5 kWh of electricity, and 0.3 pounds air pollutants¹”

In 2004, Wellesley College consumed over 132,050 pounds of paper. While we cannot quantify these costs, we can see that the environmental costs are in fact significant. A reduction in paper usage can not only bring about financial benefits but also bring about environmental benefits on the whole. Aside from reducing water use, electricity use, air pollution, and landfill waste, decreasing paper use also helps preserve natural forests and habitats. Also, successful implementation of a policy that reduces paper use sets a positive example to the rest of society and encourages others to follow this example.

Our proposal is to reduce paper use by increasing the availability of duplex printing. Most of the old printers that currently do not have duplex trays are compatible with duplex trays, thus making it possible to simply buy the corresponding duplex tray instead of a brand new printer. The installation of duplex trays in all heavy-volume printers is a very effective way to reduce paper usage at Wellesley. There are many benefits of using double-sided printing. First of all, double-sided printing increases both printing efficiency and productivity because duplex printing technology allows users to print both sides of a two-sided document in one pass, thus minimizing the paper needed. Furthermore, double-sided printing significantly reduces paper waste, and lowers the cost of buying paper. By eliminating needless paper use, Wellesley College will be able to save money on paper and lower costs in the long run.

¹ http://www.greencampus.harvard.edu/cerp/better_printing.php

Analysis:

Most colleges and universities have pay-for-print policies where students are given a quota of free pages and charged for additional pages. This quota can vary from 100 pages per semester to 100 pages per week. In comparing policies at different schools, one can conclude that there is a variety of different policies within this pay-for-print system. Out of the numerous schools that we researched, Amherst, Barnard, and Simmons offer free duplex printing, CU-Boulder, Goucher, and Oberlin offer reduced prices for duplex printing, and Mount Holyoke and Smith offered no monetary benefit in using duplex printing as opposed to single-sided printing. Wellesley is one of the few remaining institutions that actually offer free and unlimited printing to students, faculty, and staff. While BC, Swarthmore, and Vassar also offer free printing, BC and Vassar are currently considering implementing a pay-for-print policy.

While our proposal does not specifically have to do with instituting a pay-for-print policy, it is important to see how these policy changes have been introduced and implemented at other schools. Almost all of these previously mentioned schools also upgraded all printers to allow for duplex printing at the same time that they instituted the pay-for-print policy. We were unable to find a school that simply changed their purchasing policy (by upgrading all printers to duplex printers) without also instituting a policy aimed at changing printing behavior.

The University of Colorado at Boulder (CU-Boulder) implemented a Campus Printing Initiative (CPI) in 2001 that established a free printing quota of 100 pages per semester per student. For pages above this quota, CU-Boulder charged \$0.10 per page, and \$0.09 for printing on the reverse side of the same piece of paper. The CPI was

instituted to change printing behavior and to encourage duplex printing. Prior to this policy, printing at all computer labs, libraries, and residence halls at CU-Boulder was free of charge. The average cost of printing per student per year was estimated to be \$27.78.

The CU-Boulder program included printing in all student computer labs, libraries, and residence hall computer labs. After the Campus Printing Initiative was passed in 2001, a trial run of the program was successfully completed in the residence halls. During this trial run, there was a 55% reduction in paper use.² While this trial run may not reveal the actual change in printing, since printing at non-residence hall computer labs was still free, it does reveal a significant change in the printing habits of students. The Campus Printing Initiative was placed into full effect in the fall of 2003. CU-Boulder estimates that it spent around \$135,000 on printing consumables, which included printer paper and toner cartridges, and \$60,000 for the replacement of printers.³

Through a professionally-conducted survey in 1999, two years before the policy was initiated, results indicated that 34.1% of students strongly supported a pay-for-print system, 34.9% somewhat supported it, 1.6% were neutral, 29.4% did not support it, and 1.6% did not know.⁴ In 2003, after one year of the new pay-for-print policy, student support seemed roughly the same, although the percentage of students who strongly supported the policy decreased. One of the benefits of the CPI was a more equal distribution of costs. A study at the University of Indiana at Bloomington reported that 15% of the student population produced 46% of the printed output.⁵ Thus, a pay-for-print policy allowed students who printed less to not be penalized by students who printed

² <http://www.colorado.edu/cpi/whycpi.htm>

³ Ibid.

⁴ http://ecenter.colorado.edu/publications/env_survey/

⁵ Ibid.

more. Since unfunded printing costs were estimated to be increasing by 20% per year prior to the institution of the CPI, it made economic sense to change the system to accommodate different printing needs and its associated costs. The new system helped reduce costs for the college, and hopefully also for the students. At other colleges and universities, similar policies reduced around 50% of printing. A reduction of 50% at CU-Boulder amounted to about 7.5 million prints per year. According to their data,

“A reduction of 7.5 million prints per year saves: 1,260 trees annually, 3,150 pounds of air pollution annually from manufacturing process, 367,500 gallons of water annually from manufacturing process, 215,355 kilowatt hours of electricity annually from manufacturing process, and 4,252 cubic feet of landfill annually”⁶

At Goucher College, a Print Wisely program was instituted which was fairly similar to the program at CU-Boulder. The free quota of 600 pages per semester amounted to roughly 43 pages per week. While CU-Boulder’s quota was insufficient, students at Goucher found that the quota was usually sufficient for their normal printing needs. Although Goucher set its quota at a higher number, each side of the paper used counted as one page, thus, there was no monetary incentive to print double-sided. However, this system did encourage students to change their printing habits and only print when necessary. A reduction in paper usage was observed. Similarly to CU-Boulder, Goucher updated all of its printers to duplex printers. In addition, a resolution was passed by the ir Student Government stating that all professors should encourage and accept double-sided assignments.⁷

CU-Boulder Campus Printing Initiative and Goucher College’s Print Wisely programs show practical and successful examples for us to follow. Not only do they

⁶ <http://www.colorado.edu/cpi/whycpi.htm>

⁷ <http://www.goucher.edu/x4959.xml>

show the benefits of a clear duplex printing policy, but they also provide us with detailed procedures for implementing our proposal and possible future policies aimed at changing printing behavior.

Implementation:

Currently, printers are bought through Wayne Randall. He is in charge of purchasing all new printers and duplex trays. The average cost of a duplex tray is \$240. There are no additional costs associated with installing additional duplex trays and software, as minimal time is required and information services already does so with new printers. No new training would be needed, and thus the only costs would be the purchase of the duplex trays. There are direct monetary benefits to buying duplex trays for old printers. While printing has increased due to the increasing number of courses using e-Reserves, paper usage has decreased since the introduction of duplex printers. A reduction of about \$6,000, 10% of total paper cost, was achieved this past year.

In 2004, Wellesley spent \$66,220.70 on 2641 cases of paper. Each case of paper contains 10 reams of 500 sheets each. This amounts to a total of 13,205,000 sheets of paper in 2004 alone. The average price per case is \$27.95, which translates to about \$0.0056 per sheet of paper. To calculate the net benefit of buying duplex trays, we calculated the monetary benefit in paper saved per printer and compared this value to the average cost of a duplex tray. Since we were unable to obtain data on each printer, we assumed an equal amount of work for each printer, with work being defined as the number of pages printed (x). To find x , we set the number of total sheets of paper equal to the number of duplex printers $\times x/2$ + the number of non-duplex printers $\times x$. x amounted to 68,776 pages per printer per year. Next, we calculated the paper savings of

a switch from single-sided printing to duplex printing, assuming a 50% decrease. The amount of paper saved amounted to 34,388 sheets per printer per year. We then multiplied the amount of paper saved by the average cost per sheet to get a savings of \$192.57 per printer per year. While this number is lower than the average cost of \$240 per duplex tray, the benefits still outweigh the costs in the long run. Because printers last for around 3 to 5 years, depending on use, we can see that the total benefits would outweigh the one time cost of \$240. Assuming a printer lifetime of 4 years, the total benefits would be about \$770 for the lifetime of the printer, which is significantly greater than \$240. Using these numbers, we can also conclude that Wellesley would earn back the initial cost of the duplex trays in less than two years.

There are very few external costs to society through the implementation of this project. There is some pollution due to the production of these duplex trays, but overall, the benefits greatly outweigh the costs. The duplex trays will enable the college to use less paper and decrease air pollution, water use, electricity use, and landfill waste. Also, the use of less paper will help preserve natural forests and habitats. When weighing these environmental costs and benefits, we can see that the benefits will greatly outweigh the costs, especially considering that a duplex tray can last for years, and accrue more benefits in the long run.

Due to the difficulty of quantifying ecological costs and benefits, we only considered the costs of buying duplex trays and the benefits of decreased paper consumption. From our cost-benefit analysis, we are fairly confident that there are clear monetary benefits to implementing our policy. The main obstacle that we may run into has to do with the willingness of the College to change their policy. Because Wellesley

College is already on the way to phasing out old single-sided printers by purchasing duplex trays for all of its new printers, there may be some disagreement over whether this policy is actually necessary. Due to current budget restraints, the administration may very well decide that they do not have the immediate funds and that this project does not require immediate attention. However, our analysis does show that the initial cost should be earned back in less than two years. Also, as the amount of printing increases as e-Reserves become even more widely used may cause the benefits to be even higher than our estimate.

Our policy is solely concerned with buying duplex trays for existing printers. Thus, implementation of this project should be fairly simple. Instead of waiting for printers purchased before 2003 to stop working, Wellesley would simply start buying duplex trays for all printers, old and new, that are compatible with duplex trays. Installation and defaulting printer settings to duplex printing would require fairly minimal costs. While these purchases may not specifically cause students to change their printing habits, the benefits in terms of decreased paper usage are already significant on its own.

Conclusion:

Our results show a clear monetary benefit to Wellesley College in buying duplex trays for all its printers. Assuming an equal number of pages printed for each printer, we were able to calculate total cost per printer as \$240, and total benefit per printer at \$193 per year. Assuming an average printer lifetime of four years, total benefits per printer would amount to \$770. These numbers clearly indicate that Wellesley would benefit financially from such a switch. Also, the environmental benefits to society in decreased

pollution and preservation of natural forests greatly outweigh the initial environmental costs in producing new duplex trays.

The next step after implementing this proposal would be to consider a policy aimed at changing printing behavior among students, faculty, and staff. Based on policies at other colleges and universities, Wellesley could implement a similar pay-for-print policy, or simply run a campaign to increase awareness on campus about paper and printer cartridge consumption. These policy changes would help Wellesley reduce paper consumption at its source.