

EDUCAUSE Center for Applied Research

Research Bulletin

Volume 2006, Issue 6

March 14, 2006

PrintSense: Making Sense of Print Management

Frank Nardoza, The College of New Jersey

Nadine Stern, The College of New Jersey



Making efficient use of resources and keeping operational budgets in check continue to be important priorities for information technology (IT) initiatives. Among the many challenges facing higher education is management of the student printing environment, especially as digitized and “born digital” materials constitute an increasing percentage of course materials. Students may choose to print many of these digital resources, so institutions are challenged to minimize expenses related to printing supplies, equipment, resources, and environmental impact.

The College of New Jersey (TCNJ) has a fairly typical computer lab operation, with 30 state-of-the-art computer labs located throughout the campus in high-traffic areas such as the School of Business, the social sciences building, the student center, and the library. The lab environment consists of a Novell network with workstations, print servers, and monochrome laser printers. These workstations host the most popular operating systems, such as Windows, Macintosh, and UNIX, running various applications and services. Between 2003 and 2005, lab printing consumed more than 50 tons of paper. If laid end to end, this paper would cover the distance from New Jersey to Florida and back. Ironically, the most promising paperless educational tools, including courseware and the Internet, have triggered a dramatic increase in hard-copy output. Without additional funding available to cover printing expenses, the IT department was charged with finding a solution to reduce the substantial costs associated with hard-copy output. The solution has become known campus-wide as the PrintSense Environmental Program.

This research bulletin describes the process by which TCNJ considered choices and built a functional model for managing printing costs, resources, and support, and it includes questions that institutions should consider when constructing similar models.

Highlights of Print Management

Many college administrators estimate that almost one-third of the pages that leave their printers are wasted—discarded immediately in some cases, never even picked up in others (Olsen, 2002).

As a national trend, the locus of student printing has gradually shifted from photocopying book pages to printing electronic materials, typically in college computer labs. The budget model of an institution affects the manner in which print management solutions can be studied and implemented. TCNJ uses a centralized funding model in which IT centrally covers printing expenses in all labs. As a result, escalating costs were absorbed in one place and began to impact the overall IT budget. Institutions that have a mechanism to charge students for printing or that do not provide “free” printing in computer labs would have a very different set of issues to consider in developing a print management plan. At TCNJ, the numbers were substantial enough to make IT management, college administration, and then students aware of the significance of the issue from both usage and cost perspectives.

Like many of our peer institutions, early on TCNJ did not measure or try to control print expenses. The perceived increase in print costs and the constraints of the college budget were the real factors that brought this to our attention. When we started to examine this issue, we found computer lab printing costs at TCNJ had increased nearly 70 percent over two years: from \$30,935 to \$52,377. Printing of electronic information had increased by an average of 14 percent per year. The increase correlated with a steady decline in public photocopier use, which had decreased approximately 10 percent each year.

At TCNJ, printing costs were annually consuming increasingly larger portions of the IT operating budget. In many cases, keeping up with the demand required subsidizing print expenses through other IT projects. In the past, the major cost of printing was printer hardware, but over time the cost of supplies (paper, ink toner, and so forth) has outweighed that of the hardware. According to market researchers International Data Corporation, the cost of supplies will likely be more than double that of the original hardware purchase (Kmetz, 2001).

When developing a benchmark to measure printing costs, it is important to include costs in addition to paper that impact your campus, such as print cartridges and human resources. Print manufacturers cite cartridge life in terms of coverage on a printed page. For example, a commonly used monochrome laser cartridge may be rated at 10,000 pages at 5 percent coverage. The latest ISO—the International Organization for Standardization—standard of 5 percent coverage equates to 1,558 characters at 10 point type, standard serif font, on letter-size paper (ISO, 2004). When larger fonts or graphics are used, however, toner cartridges must be replaced much more often. Typically, pages actually require closer to 20 percent coverage, thus shortening the expected life of a cartridge significantly.

For example, toner cartridges designed to print 10,000 pages at 5 percent coverage will cost \$125 per month (assuming an average of 10,000 printed pages per month). Printing simple Web pages with graphics requires as much as 20 percent coverage, however, and this can result in a toner cartridge printing as few as 2,000 pages, thus increasing the annual cost by 500 percent.

Staff time and service contracts are two major types of human resources that must be incorporated into your model, since lower pricing, better functionality, and smaller size have made printers more convenient to install in more locations than ever before. Often it is more economical to purchase a new printer than to repair one that is out of service.

Who Is Doing All the Printing?

Leading up to the launch, IT tracked and analyzed two years of print usage data. This information was valuable in determining a fair print allocation and choosing which system to put in place. The most significant discovery was that the majority of students were not abusing print labs, with 80 percent printing fewer than 600 legitimate pages per semester. Since this seemed reasonable, we focused instead on the 20 percent of students who were printing 60 percent of the total volume. These students printed

between 600 and 23,777 pages and accounted for more than 1.3 million pages in one semester.

Implementation Considerations

With no other means to cover printing expenses, IT at TCNJ was charged with finding a method to minimize the cost associated with hard-copy output. IT considered several approaches to address this growing problem. We researched what other schools were doing, especially schools that charged equal or higher tuition and fees and computer access fees. We found numerous and increasing examples of colleges either charging for paper or not providing paper for printing in their computer labs. This empowered us to proceed in developing our own program. As a public institution, we are committed to serving our students and considering increasing costs for education. We did not want to simply charge for paper. We also knew that our students would react negatively if we charged for something that had previously been free. In addition, numerous IT staff members were aware of the environmental impact of paper usage. These considerations informed our preferred solution.

We spent nearly a year developing our proposal and taking it through several levels of input and approval within IT management and then to the college's cabinet officers.

Any plan to roll out a print management program must contain the components below. TCNJ built our rollout based on specific campus budget models, lab configurations, student expectations, and technology options. Your campus structure could significantly alter your approach to these steps, but each step still needs to be included in your plan.

- *Identify stakeholders.* This includes a broader range of campus members than you might initially think—not only does it involve students, who are the primary consumers, but also faculty who suggest/require printing of course materials. Another important constituency is the IT staff members who will implement, support, market, and defend the print management program. Early in the process, we recognized the importance of reaching out to the most influential constituents at the college, which included meeting with faculty, the cabinet, and the Student Government Association (SGA). We set up meetings, gave a demonstration of how the system would work, and answered tough questions.
- *Build a comprehensive communication plan.* Student perceptions can be a major obstacle to success, which is why a well-thought-out communication plan is part of each initiative that financially impacts students at TCNJ. Rather than increasing student fees, the program emphasized how the institution was trying to equalize print usage, conserve resources, and set a fair standard. This approach appealed to everyone. With the support of the SGA, we were prepared to launch our program and gain further acceptance and buy-in from the SGA (we solicited their feedback at every step). The community-wide e-mail system was the fastest and easiest way to reach the entire student body. We sent short memos with links to the PrintSense Web site, which included greater detail. Through the Web site, students could obtain their account balances and a detailed 30-day report of their printing activity. In addition, the Web site included

environmental facts, frequently asked questions (FAQs), ongoing results of the print-savings initiative, and an anonymous feedback form. Concurrently, we met with the weekly college newspaper, which published several articles about PrintSense and the positive reaction of the SGA. We also used posters in the print labs and affixed “PrintSense Enabled” stickers to each printer.

- *Stress the positive environmental impact and cost-avoidance over revenue generation for the college.* We found that embracing the issue of environmental impact of printing was a successful strategy, pointing out that our goal was not to generate revenue but rather to keep upwardly spiraling costs down. We communicated the importance of conserving resources, equalizing print usage, and setting a fair standard. We encouraged students to take control of the situation and monitor their printing habits. We developed the PrintSense program name and logo that embodies doing the smart thing, both ecologically and economically (see Figure 1).

Figure 1. The PrintSense Logo



- *Allow for an adequate testing period.* Our initial inclination was to implement the program a full semester sooner than we did. As a result of SGA feedback, it was decided to implement a test phase in the spring instead. This allowed students to become acclimated to using the system without worrying about charges and gave us additional time to fully test the system. In addition, allowing students to practice managing their print habits became worthwhile in building confidence in the program.
- *Collect data for a full academic year in order to validate the printing limits you intend to place on students per semester.* Having and sharing this information gave us credibility in the eyes of students, faculty, and administration.
- *Run an announced pilot program for at least one full semester.* This helped us identify a few glitches in our plan, including the need to address printing for student organizations and community users in the library. The rollout logistics dictated when we would communicate information. We felt students would likely forget news over the summer break, and therefore we conveyed minimal information in the spring. We began using “teaser” messages to spark interest

(and in some cases concern) for students to grasp the concept. We followed these with more specific information and updates in the fall semester as the launch drew closer.

- *Offer free printing during the testing period.* This demonstrates that the main goal is not to add to students' expenses but rather to track printing and encourage conservation.
- *Gain student acceptance.* Despite the environmental benefits of print management, one of the biggest hurdles is justifying charging students for something that was once free. If you suggest to students that they will be charged for printing school work, they will insist that their professors require them to print volumes of articles, presentations, homework assignments, or even complete textbooks. What they fail to recognize is the savings on textbooks, because in many cases purchasing a textbook was not required. Another common student complaint is that some majors require more printing than others. After carefully analyzing data on all majors from nursing to education, TCNJ did not find evidence to support this claim.
- *Ensure the cooperation of your student billing department.* It is critical that the student billing process works as well as the technology. If you start to implement a system that is improperly counting copies made and/or applying incorrect charges to the student bills, a public perception nightmare could ensue. It is therefore critical to have a strong partnership with your student billing office, which will not only need to apply the charges but also answer many of the students' questions.
- *Consider the impact of the system once it is in production.* It is also important to be clear on how various campus departments will be required to support this system in production. While one department may be running the program, others are certainly required to provide support. This type of initiative requires cooperation among multiple areas in and out of IT—networking, desktop support, help desk, and student accounts. Each area needs to understand the importance of this project and its role in making it a success.

Technology Assessment and Selection

We explored three common approaches to print management and billing:

- *Print release system.* This method integrates with a magnetic card system. The system checks a user's balance for available funds and debits a predetermined amount for each page. The print job is sent to a queue, where the user releases the print job using a magnetic college ID card or temporary password.
- *Printer accounting system.* Students are allotted a certain amount of free prints. If students exceed that allocation, they must either replenish the account or be billed for overages.

- *Time-period containment system.* Students are allocated a specified number of free prints for a certain time period. When they reach their allocation, printing expires until the next time period when accounts are reset by a system administrator.

Depending on objectives and policies, schools can consider options that combine two or three of these models. In addition, they should use the five assessment criteria below to determine the eventual effectiveness at reducing print waste:

- *Factor staff support into the decision.* This program could cost a great deal in staff support if it is not implemented properly. It is an important goal to maximize the effectiveness of staff support time. Any system that requires a lot of staff intervention is by nature adding costs.
- *Increase cost-effectiveness throughout campus.* During review, it is important to think about what will maximize the already strained printing budgets of IT and individual departments. If you plan to shift costs from one department to another, you can unintentionally defeat your overall purpose.
- *Improve supply inventory and lab appearance.* One major goal is certainly to reduce student waste and keep labs tidy. It is important to consider how paper and cartridge supplies in labs are managed and, if possible, improve the conditions of the labs as the program is developed. TCNJ found that cutting back on printing also had the positive effect of reducing the times when labs ran out of paper during night or weekend hours. When students are more responsible for the paper they use, they are also more careful not to waste pages, which results in less trash in the labs.
- *Upgrade existing devices and deploy new ones.* The implementation of a print management program is an ideal time to also review your printers and to replace and install the best fit printers around campus.
- *Offer the best delivery mechanism to students.* It is critical to implement a system that will not adversely affect students' ability to complete course assignments or require them to learn a complex new system to do basic printing.

The TCNJ Choice

TCNJ carefully considered all three print management options with the above criteria in mind. Our major objective was to reduce print waste, which, along with our service ethic, became the basis for our assessment of the various methods. We quickly eliminated the time-period containment model as an option because of its negative impact on students. Using this method, students would be prevented from printing once they hit their maximum, until they could contact a system administrator and refresh their accounts. If this occurred at an inopportune time and interrupted an important project, we would not be able to provide acceptable service.

We then eliminated the print release system (PRS) due to its complexity. We felt that this system overly burdened the students and added hardware support complexity for IT. A

print release system involves installing additional hardware at every printer location, resulting in the need for additional funding. It also increases demands on support for trouble calls and can result in students waiting in line at a release station to retrieve a print job.

After careful consideration, TCNJ decided that the benefit of using Equitrac's printlog accounting server (PAS) was a better fit than a PRS. The simplicity of PAS far outweighed the cost of a PRS. We also liked that the PAS automatically creates accounts and allocates a quota of free prints before charges begin to be applied. Since our goal was primarily to limit waste rather than to charge for all printing, this system more appropriately focused on overuse by the small percentage of students who were printing very large volumes.

We chose Equitrac because of its overall capabilities, including its systems, support, and cost-recovery expertise. Other major advantages far outweighed the disadvantages.

The advantages included the ability to

- generate detailed real-time reports by the accounting server via e-mail, onscreen, or printout;
- set quotas allowing credited amounts for students;
- base pricing on flexible charges for different types of printers (black and white or color);
- generate e-mail to students who have exceeded their credit limit;
- create reports of students who have a negative balance and export information for importing into other systems;
- use Lightweight Directory Access Protocol (LDAP) to create Novell accounts on the fly and credit each account with a specified amount;
- generate cost-analysis reports;
- run independently of Social Security numbers or CWIDs (TCNJ's campus-wide ID);
- use a relational database that allows for flexibility between different platforms and database applications;
- print and charge back when the system is down; and
- create Web-based detailed reports, balances, and statements.

In addition, the system required little additional cost and IT staff to set up and implement, minimal hardware and network cabling, and was easy to administer.

The disadvantages included:

- The system did not interface with our Campus Card system (Blackboard Transaction System) current release.
- Overdrawn students either had to pay at the business office or be charged on their student bills, involving other departments in the transaction process. As we implemented the system, we found that student accounts office willingly cooperated in adding these charges to students' bills, thereby avoiding potential problems.

As configured, TCNJ's PrintSense print management system consists of several components: a user workstation, a Novell Distributed Print Services Server, the printer accounting server, and printers. When a lab computer user requests a print job, the printer accounting server automatically checks to see if the account exists. If no account exists, using the Novell user name and password, the system automatically creates an account on the printer accounting server and credits the user \$30, or a free 600-page print allocation per semester. The system automatically debits the account \$0.05 for each printed page. If students print more than the 600-page allocation, they can still print. However, a \$0.05 charge per additional page is added to the student bill at the end of the semester. The per-page cost is based on the cost of all printing hardware and consumables and is strictly for cost-recovery purposes. As such, it does not include staff time for printer installation, setup, and support (it was never our goal to recover those costs as well).

Program Successes

Since the program went live in fall 2005, TCNJ has witnessed a 41 percent reduction in printer output from the previous fall. In addition, 93 percent of the student body printed within the allocation of 600 pages—a savings of approximately \$17,000 in the program's first semester but even better for the environment with more than a million fewer pages printed than the previous year.

Implementation of the print management program also allows IT to analyze printer activity and monitor which printers require more attention and/or replacement, enabling the department to accurately budget for upgrades and improve in-house IT service. Campuses may identify additional benefits that should be communicated during and upon successful rollout of the print management program.

What It Means to Higher Education

To achieve success with a print management program, it is imperative to know the campus culture and the value placed on environmental impact, the campus printing habits, and the existing student computing fee structures. Rightsizing the solution to the specific needs of your campus is critical to success. Engage the support of student government and environmental groups—students will be more responsive if emphasis is placed on limiting printing volume and containing costs for environmental benefit rather

than changing their behavior, especially if the abusers represent a small percentage of the students.

With the right technical solution and an effective communication plan, a print management program can benefit your campus significantly while conserving scarce resources.

Key Questions to Ask

- What are the highest priorities for your institution with respect to student printing? Cost containment? Reducing unnecessary printing? Minimizing environmental impact? Other issues?
- How is student printing financed at your institution? Are printing costs centralized or distributed?
- How is student printing currently measured and tracked? Is a more effective system desirable? Do you have enough data to successfully explain and market your desired approach?
- What are the print management choices?
- Who will support a new print management system?

Where to Learn More

- The College of New Jersey PrintSense Web site, <http://www.tcnj.edu/~printing/>
- University of Richmond School of Law printing survey. Retrieved January 23, 2006, from <http://law.richmond.edu/librarytech/printsurvey.htm>
- Vyomesh, J. (2005, September). Take control: Total print management. Hewlett Packard. Retrieved January 31, 2006, from http://www.hp.com/hpinfo/newsroom/feature_stories/2005/05tpm_joshi.html?mtxs=home-corp&mtxb=b1&mtxl=
- IKON Document Efficiency Analyzer (IDEA). Retrieved January 23, 2006, from http://www.ikon.com/about/document_efficiency/doceff_analyzer.asp
- University of California. (2003). How much information? Retrieved January 23, 2006, from <http://www.sims.berkeley.edu/research/projects/how-much-info-2003/print.htm>

References

- International Organization for Standardization (ISO). (2004, June 16). Information technology—method for the determination of toner cartridge yield for monochromatic electrophotographic printers and multi-function devices that contain printer components. [ISO/IEC 19752:2004]. Retrieved January 23, 2006, from <http://www.iso.org/iso/en/CatalogueDetailPage.CatalogueDetail?CSNUMBER=34911&scopelist=PROGRAMME>
- Kmetz, K. (2001, May). The expanding role of document accounting systems: Significant benefits gained in better output management by lowering waste, improving device deployment, and enhancing supplies management. [IDC white paper.] International Data Corporation. Retrieved January 23, 2006, from http://www.equitrac.com/docs/equitrac_das_wp.pdf
- Olsen, F. (2002, October 4). Ten ways colleges can cut IT costs. *The Chronicle of Higher Education*, 49(6), p. A39.

About the Authors

At The College of New Jersey, Frank Nardoza (nardoza@tcnj.edu) is Associate Director, Access Technology, and Nadine Stern (stern@tcnj.edu) is Chief Information Officer, Information Technology and Student Services.

Copyright 2006 EDUCAUSE and Frank Nardoza and Nadine Stern. All rights reserved. This ECAR research bulletin is proprietary and intended for use only by subscribers. Reproduction, or distribution of ECAR research bulletins to those not formally affiliated with the subscribing organization, is strictly prohibited unless prior permission is granted by EDUCAUSE and the authors.