Athena Working Group

Phase 1 Report
Revision 1.0
June 2010

1 Working Group Context

1.1 Charter & Foundation

- Chartered to deliver short-term recommendations by mid-May to Dan Hastings and Marilyn Smith and begin the groundwork for a second phase to report on strategic options and long-term student computing directions at MIT
- Task force recommendations to reduce waste and explore cost savings related to public student printing and Athena clusters
- Classroom Committee recommendations on Athena clusters (2007,2008)
- Undergraduate Association participation, reports, and recommendations

1.2 Work Process & Participation

- Working Group began meeting in mid-March 2010
- Broad participation from Libraries, OpenCourseWare, OEIT/DUE, School of Architecture and Planning, Undergraduate Association, IS&T
- Discussions, space site visits
- UA-sponsored student survey on printing and Athena/spaces (*see 6.7 UA-sponsored student survey on spaces and printing for results*)
- Data collection & metrics analysis
- Hold and release printing pilots in W20 & Baker House

1.3 Working Group Members

John Brisson	*Faculty Chair*
Evan Broder	*Undergraduate, UA, SIPB, MITCET*
Cec d'Oliveira	*OCW, MITCET*
Duncan Kincaid	*School of Architecture & Planning*
Michael Plasmeier	*Undergraduate, UA, Dorm IT*
Liz Denys	*Undergraduate, UA*
Steve Gass	*MIT Libraries*
Vijay Kumar	*OEIT/DUE, MITCET*
Oliver Thomas	*IS&T*

2 Findings

- Current space allocations, distribution, and designs are not optimal, and artifacts of Athena spaces having largely been in maintenance mode for a long time, absorbing resource and space reductions over time with no direct connection to strategic planning and design efforts
- Students continue to have a strong investment in, need for, and sense of ownership of student technology and study spaces in general

- Student computer ownership is high (close to 100%) but is not a complete substitute for centrally deployed resources
- Athena as an environment has definitely transitioned from being our students' primary computing environment to being a complement to their personal computers, but still adds unique value in areas of equitable access, applications, and space
- For students it's as much about the space as it is about the technology
- Printing cost: the current cost of public student printing is approximately $270,000 / year including IS&T-supplied dorm printers *(see 6.1 Printing Cost Summary for details)*
- Athena Clusters are only one of a large number of services delivered by components that make up what is commonly referred to as "Athena"
    - While the Institute Task Force recommendation refers specifically to "Athena Clusters," the cost estimate associated with the recommendation actually encompasses the entire Athena environment
    - Realistic savings from reducing or eliminating Athena Clusters without addressing other services provided by "Athena" would only garner a fraction of the task force estimated savings
    - *See 6.2 Athena Services & Resources Stack for a complete picture*
- Utilization of Athena clusters by students and other members of the community continues to be significant (*see 6.3 Utilization by Room for details*)

3 Strategic Direction

3.1 Spaces

- Decisions regarding student computational spaces and teaching/learning spaces should be informed by (in fact intimately connected to) institutional strategic planning efforts, educational directions, and the evolution of the MIT community
- Recommend that MIT move to a model of several (~3) large public student technology and community centers ("Community Centers"), each with a portfolio of spaces supporting various activities, that will better meet student needs than current, traditional one-computer-per-desk lab setup located in an eclectic set of unplanned spaces
- Centrally deployed resources for activities that are difficult to support with personal resources should be improved and increased: quiet study space, small team space, specialized computing space (engineering workstations and software, multimedia workstations and software, studio spaces), cantina/coffee spaces, and other spaces supporting dynamic interactions between students and faculty
- Pilot key concepts of a large student "Community Center" in the Student Center 5th floor Athena cluster and reading room to vet concepts, identify gaps, and deliver and immediately enhance services available to students
- Support through centrally deployed hardware resources for traditional desktop computing activities can be reduced but not eliminated

3.2 Computing Resources

- Centrally provided, distributed web and email access to support a highly mobile student population should remain a part of MIT's strategic direction, but should be delivered at a lower cost and detached from spaces
- MIT's infrastructure should offer more support for personal student laptop use (power, security, applications, space support)

3.3 Printing

- Centrally provided student printing should remain a part of MIT's strategic direction, and should be easy to use, governed by policy, and waste free
- MIT's student printing strategy should ultimately be consistent across CopyTech and public student printers; things such as quotas and fee models should apply across production environments to encourage students to choose the most appropriate method of printing and copying, not the one where the business model happens to work out favorably (example: making a photocopy in the Libraries involves a 10 cent fee; scanning a page on a photocopier in the Libraries and then printing it on an Athena printer is free but ultimately costs more)

4 Phase 1 Recommendations

4.1 Student Printing

- Implement a hold-and-release infrastructure for public student printing, requiring releasing of a job at the printer and requiring authentication at release
- Formally include centrally supplied dorm printers and Athena Library printers in public student printing, governed by the same policy as main campus printers
- Redistribute public student printer stations to optimal locations on campus, independent of Athena clusters where appropriate, and consolidate to larger capacity units where appropriate, maintaining some redundancy in high traffic and geographically remote locations
- Implement an infrastructure giving students more control of and information about their printing behavior; with the capabilities necessary to monitor and enforce policies MIT develops; with the capabilities to encourage and facilitate behavior MIT considers desirable
- Implement a generous quota to reign in the tail of the curve, initially set at 1500 pages per semester (*see 6.6 Histogram of Printing Volume Over Users*), with a 10 cents per page fee for over-quota printing
- Quota will apply to all users of the public student printing environment (students, faculty, staff, etc.) and centrally managed dorm printers
- Develop a public, clearly defined process for adjusting quota over time; should include DUE, DSL, IS&T, and student representation

4.1.1 Specific implementation

4.1.1.1 Recommendations

- We recommend an implementation using a Pharos-based service and devices managed by MIT's Enterprise Services (DSL) with infrastructure hosted by IS&T
- IS&T and Enterprise Services will assess whether it would be best for central redundant Pharos servers for public student printing to be administered by IS&T, Enterprise Services, or jointly
- Reduce the number of printers where appropriate and replace them with larger-capacity and more current hardware
- Hardware upgrades will be needed for most printers to make them effective for hold-and-release (current Athena printer hardware is **on average 7 years old!)**
- Transition to a leased printer model managed through Enterprise Services to encourage timely renewal of hardware

4.1.1.2 Supplementary information

- Enterprise Services currently manages a similar environment on a smaller scale for copying and non-MIT printing in the MIT Libraries
- Public IS&T/UA pilots of Pharos-based student printers in W20 (1st floor) and Baker House have been well received by students
- Significant technical, integration, and service details remain to be worked out, but initial estimates and system capabilities look like a good match
- We expect key technical details can be worked out for a fall 2010 implementation
- Pharos is the most popular commercial solution in this service area at peer institutions that have deployed managed printing for Library or public student printers

4.1.2 Cost information and estimates

- Current cost of student printing: approximately $270,000 / year
- Likely cost savings:
    - Simply eliminating waste will garner significant savings; case study in W20-575 shows approximately 20% of paper printed is never picked up
    - Completely eliminate header pages (possible with hold and release)
    - Consistent application of policy across campus/dorm student printers will reduce paper "shrinkage" (currently ~40%)
    - Initial service fee estimates from Enterprise Services show likely reduced annual costs to IS&T given stable volume; some of these will need to be applied to printer hardware upgrades
    - Improved ability to apply desirable policies will further reduce waste (mandatory duplex on large jobs, job limits during busy times, copy limit to single copies, etc.)
    - Future integration possibilities with key systems currently driving high printing demand (Stellar, for example) could further drive down Institute costs by allowing students to send course pack jobs to CopyTech printers for printing and binding, or sending large jobs to one or two high-volume printers with lower cost per page

4.2 QuickStations

- Deploy or re-deploy ~5 additional QuickStations by fall 2010 in key locations to address distribution issues and printing need and reduce reliance on cluster spaces for this purpose (for example 34 lobby, 1) after a brief analysis of current gaps
- Move several machines immediately outside key clusters, where possible with a printer, and turn into QuickStations; or create QuickStation/workstation separation in clusters where appropriate to reinforce discrete support for different activities by spaces
- Pilot thin client and desktop virtualization options for QuickStations to drive down cost per unit – underway

4.2.1 Background

- 44 QuickStation computers maintained by IS&T on main campus and in residence halls
- 6-10 QuickStation computers maintained by the MIT Libraries in the Stata Center and Libraries

4.2.2 Cost information

- Current cost per QuickStation is approximately $2000 (including furniture, security, computer hardware, and network)
- Once the "requirement" (or current state) that a QuickStation have all the capabilities of a cluster workstation is broken, one can reduce the cost of QuickStations (both hardware and "space") over time; see recommendation on piloting thin client and virtualization options
- Aim for ultimately reducing cost per QuickStation to $500 via wall mounting/securing, form factor changes, and optimization for basic communication and productivity computing only

4.3 Spaces

- There are no quick wins in spaces
- Regarding the Educational Task Force recommendation on Athena clusters: it would be a mistake to look at this recommendation in isolation. It must be considered in conjunction with key recommendations on Academic and Community Spaces
- Taking small, hesitant steps to promote major changes in the character of spaces will likely result in doing it poorly and bias the community against further changes going forward
- Continued direct usefulness to students of current spaces or of alternative equivalent or better spaces must remain strategic and short-term priorities regardless of technology installed in such spaces: study space and computing space are equally valuable to students, and becoming increasingly interchangeable
- MIT should commit to significant change in this area first and move forward in a deliberate, inclusive, and strategic fashion; resource commitment can be gradual (with SAP and CRSP design help, for example) but strategic commitment to the outcome and full timeline is a prerequisite for success

5 What's next?

- Wide communication and vetting of recommendations ("Upreach")
- Develop project plans for accepted recommendations
- Need to develop long-term costs and savings attached to key options in strategic direction, further define what those options are, and vet them with additional key stakeholders (more students, graduate students, faculty)
- Develop and execute working group process and plan for phase 2

6 Appendix

6.1 Printing Cost Summary

Answers to common questions on what we buy

Question	Answer
What paper are we buying for student printers in the clusters?	We are currently buying Office Depot item number 680017 Great White recycled copy paper, 92 brightness, with 30% recycled content. This is the paper MIT gets the best price on in quantity. Going forward, we're hoping to be able to switch to 100% recycled content paper, but we'll need to figure out how to reduce overall paper consumption or increase the paper budget before we'll be able to do so.
What toner are we buying for student printers in the clusters?	The toner used in the student printers in the Athena clusters and other public locations on campus is purchased through KSL, the company MIT contracts with to provide service and maintenance for the printers. They are currently supplying remanufactured third-party toner cartridges, HP-equivalency part number C4182XC. This is a recent change. They were purchasing HP brand toner due to spill issues with remanufactured cartridges until recently.
What is MIT providing centrally for dorm printers?	Dorm printers are a special case in that they were not formally budgeted as part of the Athena and public student printing budget, but some costs are being covered by that budget. In particular, MIT (IS&T) pays for the acquisition and renewal of hardware (resources permitting) and the annual KSL service and maintenance contract for IS&T-purchased printers. The dorm pays for consumables (paper, toner, and maintenance kits).

Note: Need to add information on color cartridges for the color printer in 37-312. Also need to add information on maintenance kits.

Recent cost figures on student printing and supplies

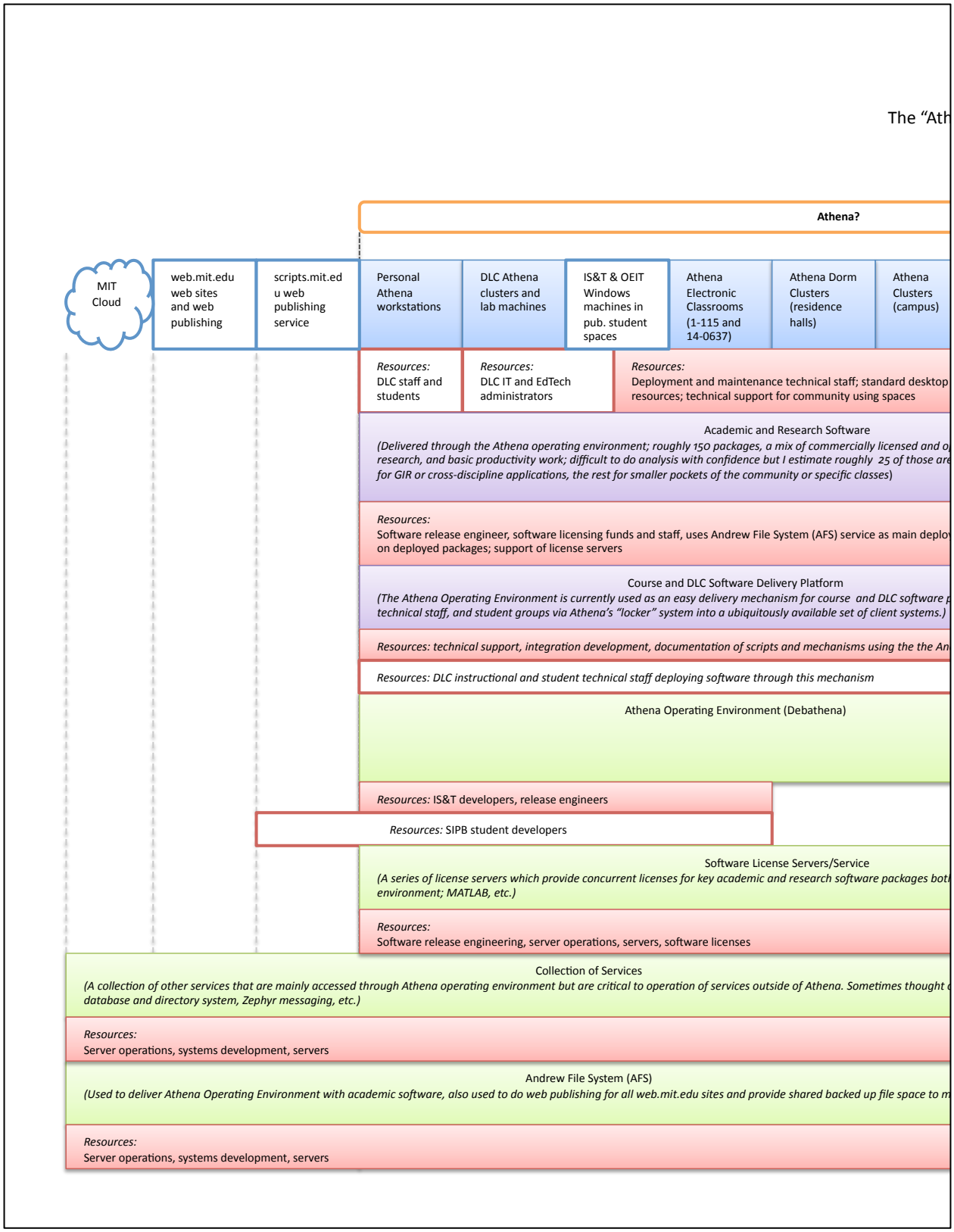
Prices in the below table are based on current prices through MIT's preferred vendors. Student printers on campus and MIT-covered costs of dorm printers are billed to MIT cost center 1570200 (Athena).

Item	Vendor	Cost or price
Total amount spent on paper with OD for public student printers in clusters 1	Office Depot	$60,006 / year
KSL contract for toner and maintenance kits for public student printers in clusters 2	KSL	$95,000 / year
KSL annual service contract for public student printers (34 b&w, 3 col) in clusters 2	KSL	$18,570 / year
KSL annual service contract for IS&T student printers (28) in dorms 2	KSL	$13,440 / year
KSL on-site extended service per year for frequent visits to cluster printers 2	KSL	$44,000 / year
Various unit costs		**Cost per unit**
Amount spent on paper per year per student 3	Office Depot	*$5.83*
Amount spent on toner+kits per year per student 4	KSL	*$6.91*
Great White recycled copy paper (680017)	Office Depot	$33.30 / case
HP Black and White toner cartridge for 8100 series (C4182XC)	KSL	$106 / cartridge
KSL annual service per printer (black and white)	KSL	$480.00
KSL annual service per printer (color)	KSL	$750.00

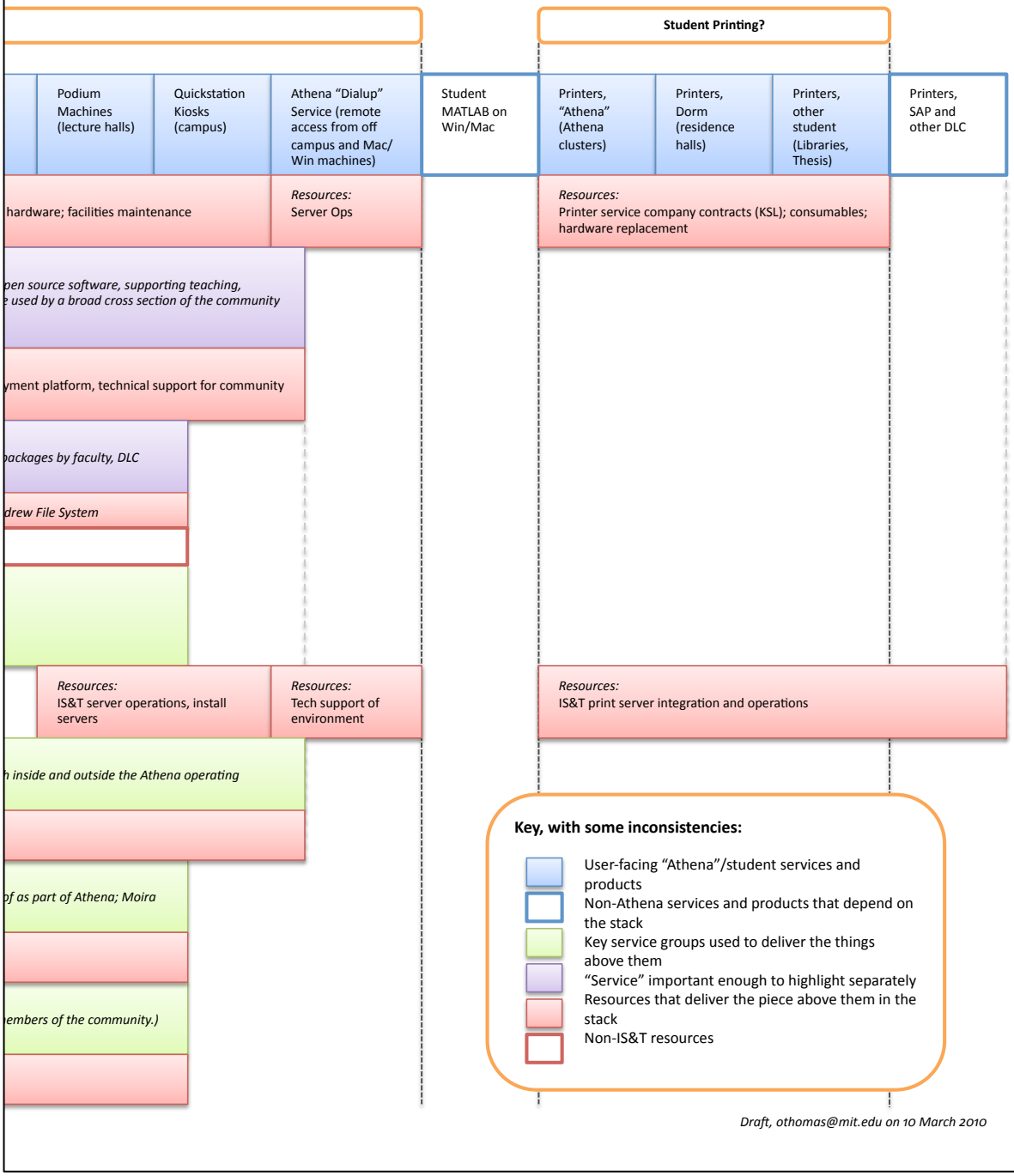
1. Annual spending on paper represents actuals for fiscal year 2009.
2. KSL contracts for service are for FY2010.
3. Need to check whether this is really student cluster printer specific. It may actually be general KSL on-site staffing that heavily, but not exclusively, benefits cluster printers.
4. Lines in italics are calculated based on 2008-2009 enrollment of 10,299.

Printing cost summary from https://wikis.mit.edu/confluence/x/7qliAw

6.2 Athena Services & Resources Stack

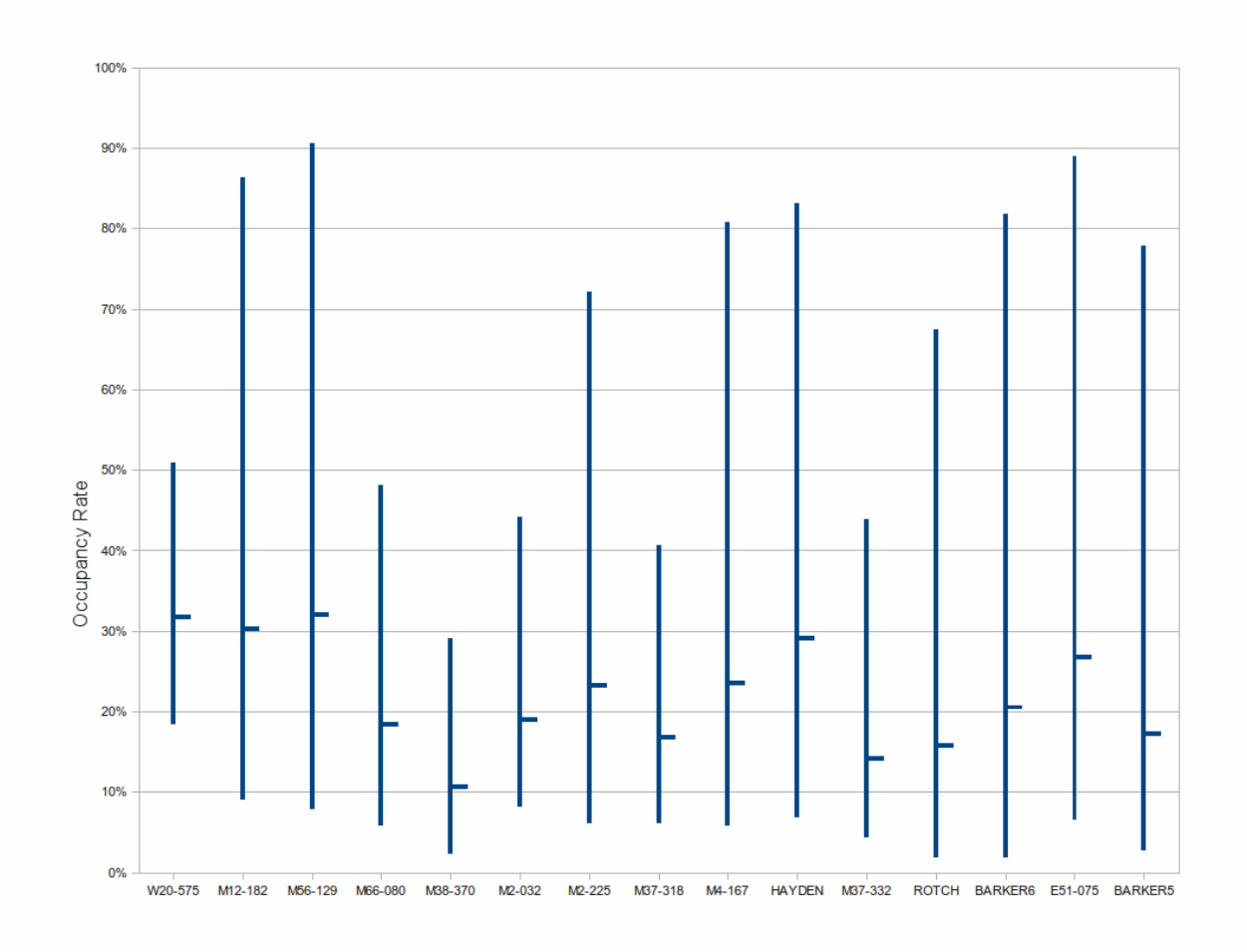


ıena Stack”

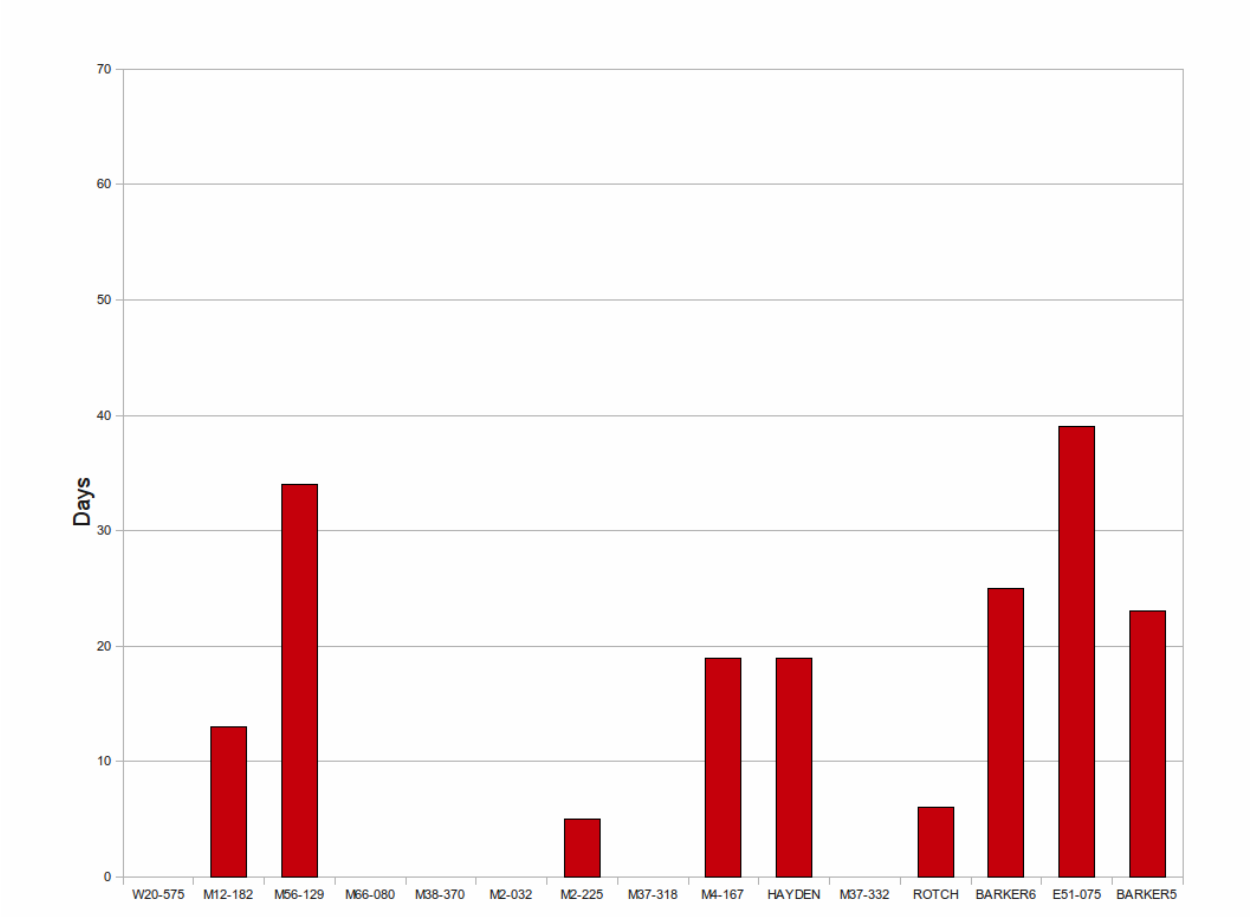


Draft, othomas@mit.edu on 10 March 2010

6.3 Utilization by Space

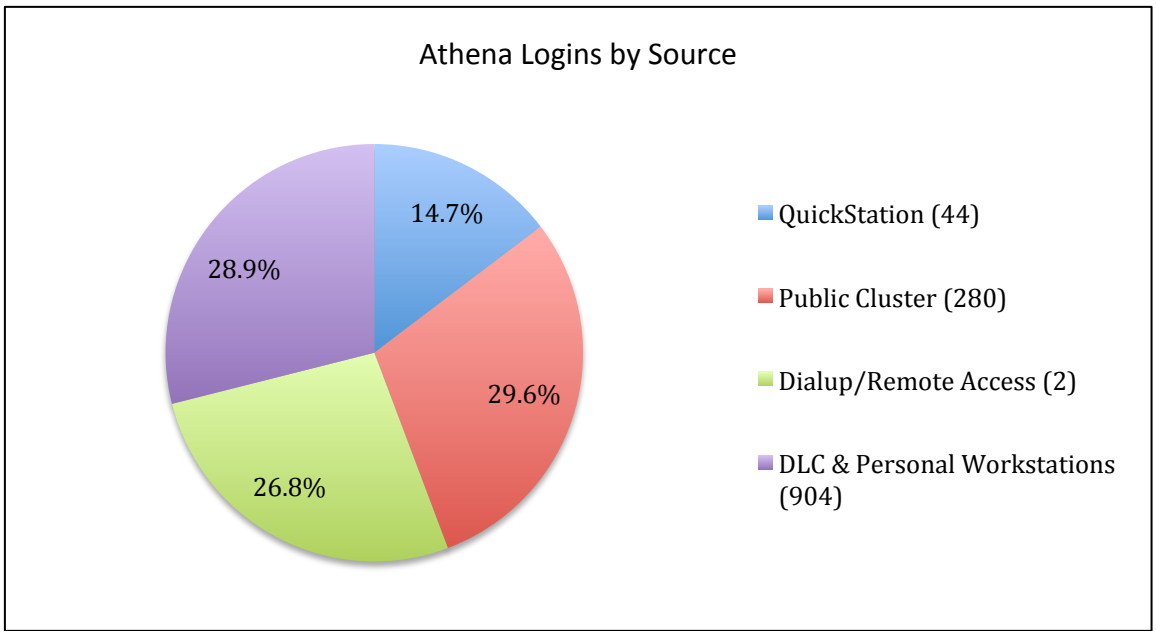


The above graph summarizes average daily occupancy rates for all public Athena cluster spaces. The extent of the vertical lines indicates the range from average daily low occupancy to average daily high occupancy. The horizontal ticks indicate average daily occupancy for the period, which tends towards the low end of the scale due low or zero occupancy stretches in the early morning hours and on weekends. Clusters are arranged largest to smallest from left to right, based on the number of available seats. *(Data from Fall 2009.)*



The bars in the above graph count the number of days on which a particular cluster had at least one occurrence of 100% occupancy, i.e. all available workstations occupied. (*Data from Fall 2009.)*

6.4 Athena Logins by Source

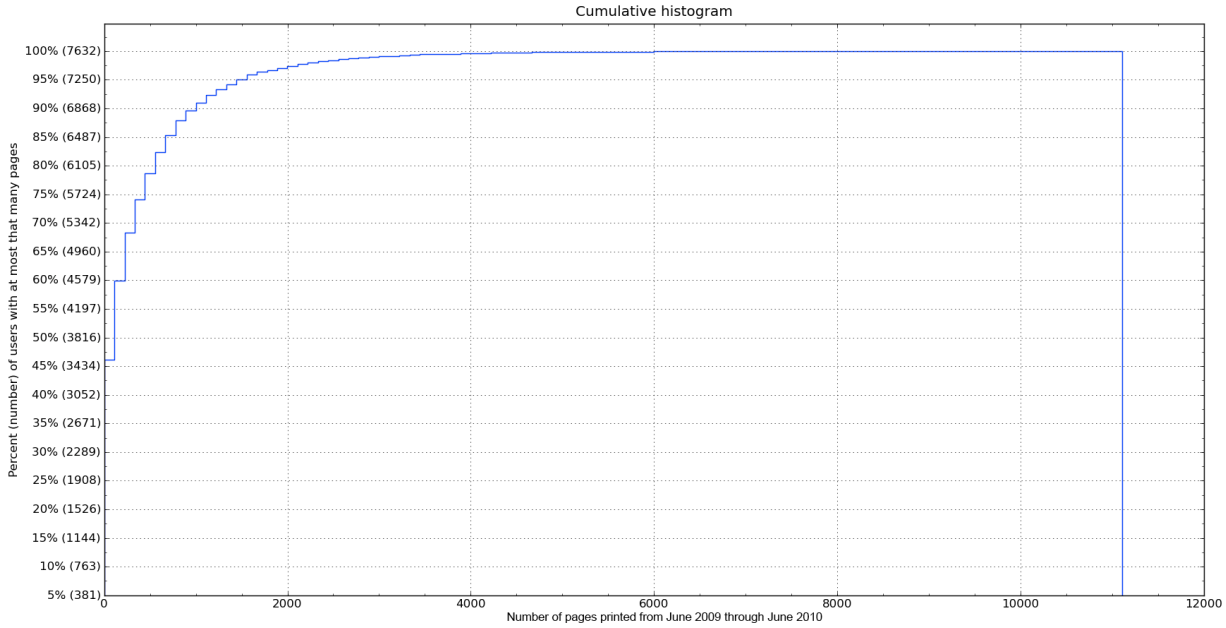


The above chart shows the number of logins across various types computers running the Athena operating environment. The numbers in parenthesis after the labels in the key indicate the computer count for each category. *(Data from Fall 2009.)*

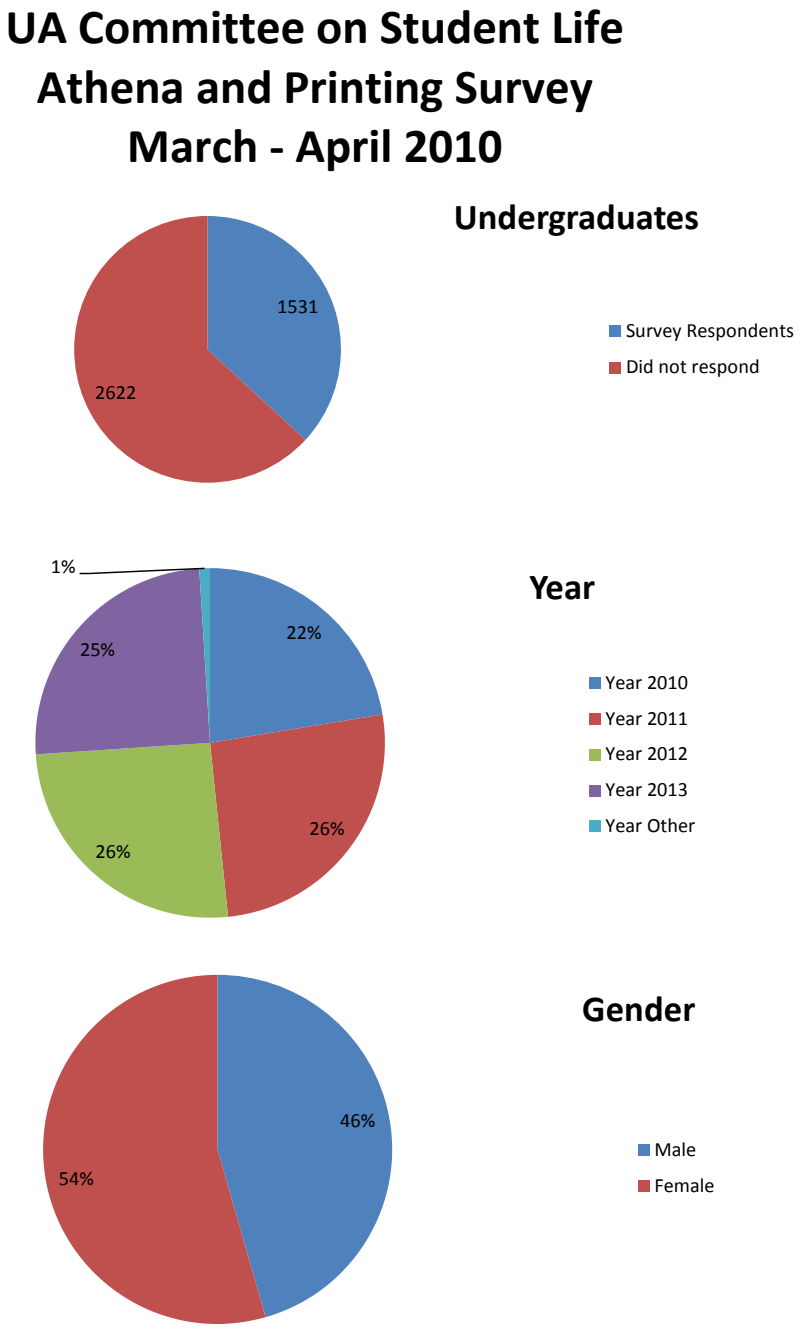
6.5 Computer Count by Space

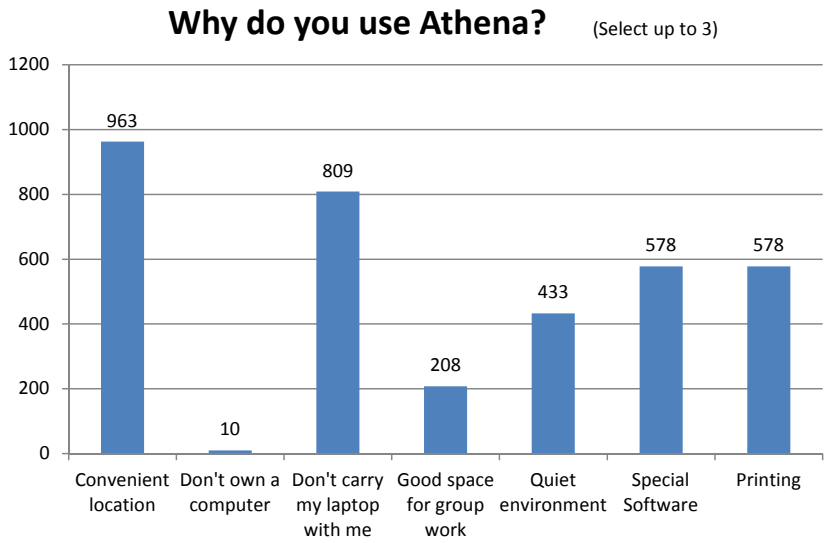
Space	Workstation Count	Space	Workstation Count
W20-575	106	Barker Library	12
12-182	25	37-318	12
56-129	23	4-167	9
66-080	22	Hayden Library	8
38-370	20	37-332	8
2-032	16	Rotch Library	7
2-225	13	E51-075	6

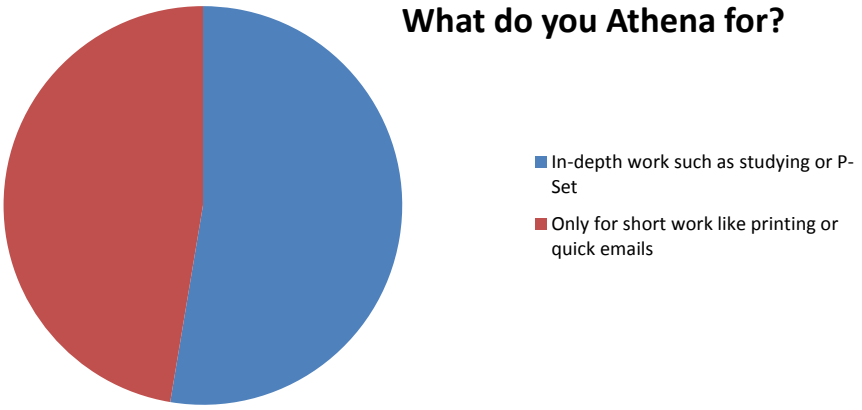
6.6 Histogram of Printing Volume Over Users

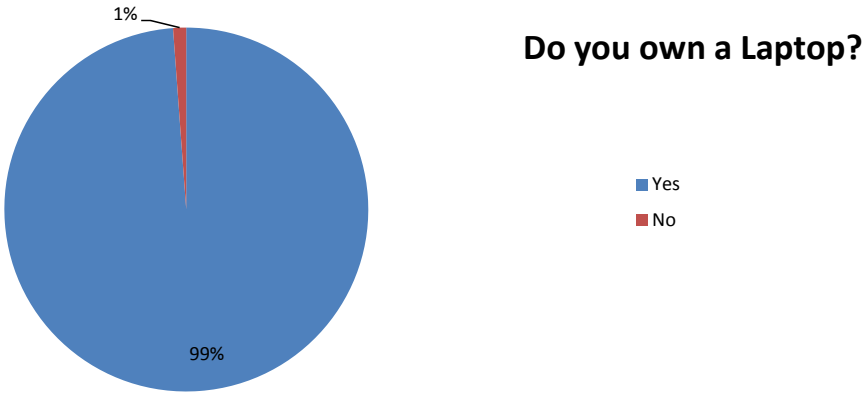


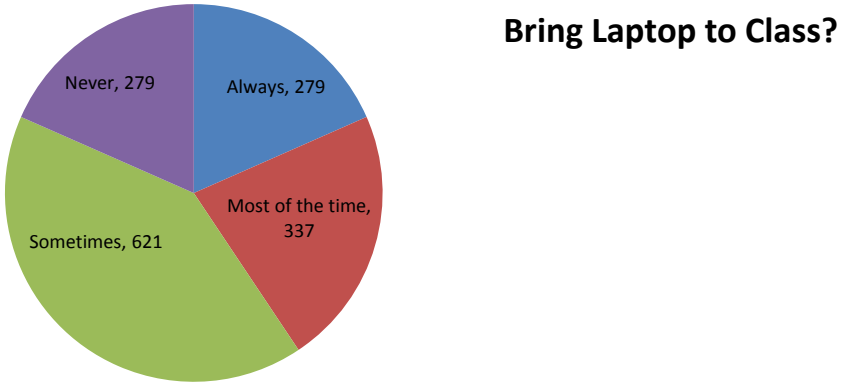
6.7 UA-sponsored student survey on spaces and printing

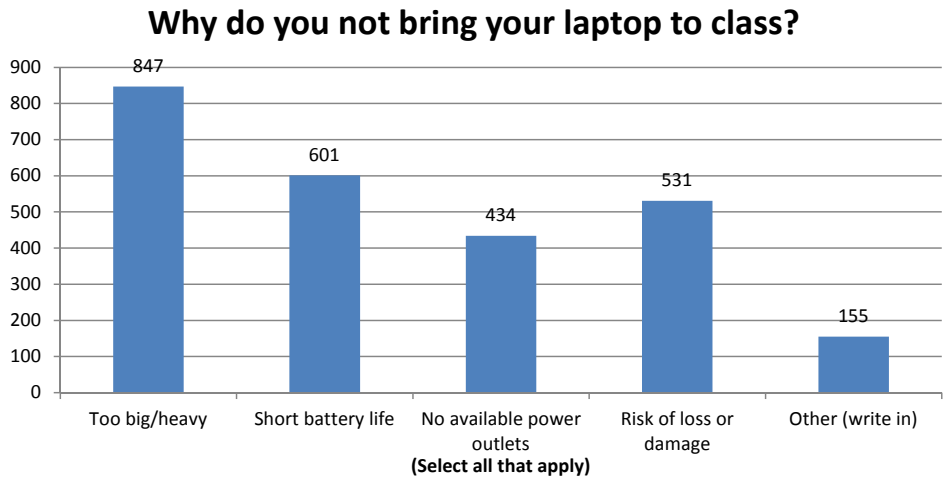


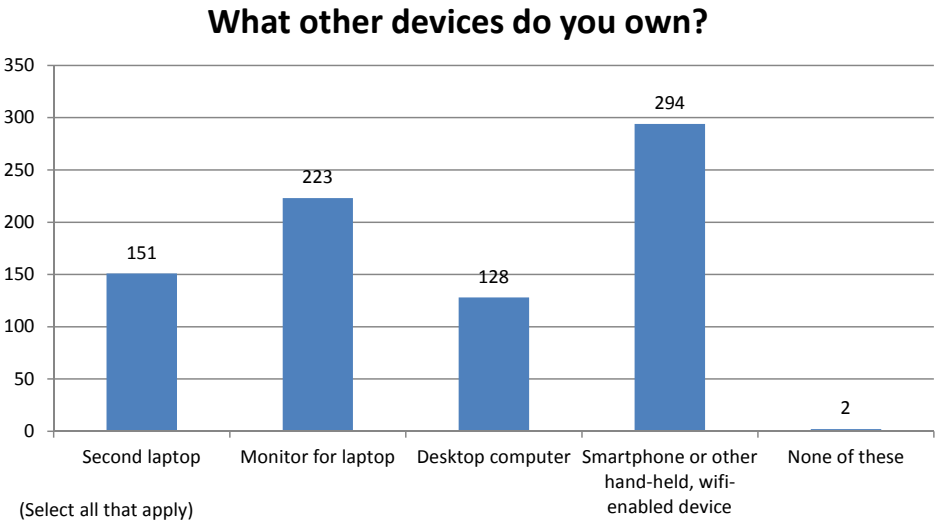

Why do you use Athena?
(Select up to 3)
1200
1000
800
600
400
200
0
963
10
809
208
433
578
578
Convenient location
Don't own a computer
Don't carry my laptop with me
Good space for group work
Quiet environment
Special Software
Printing

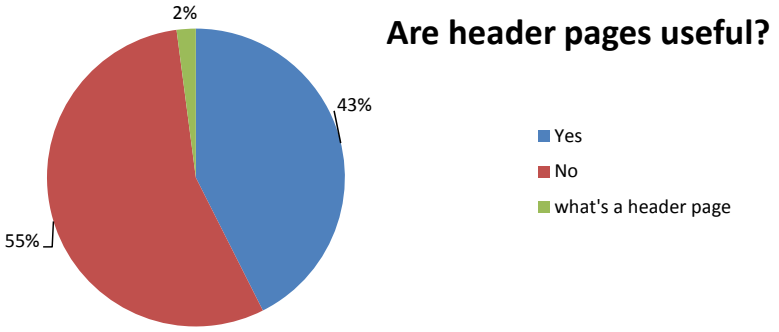

What do you Athena for?
In-depth work such as studying or P-Set
Only for short work like printing or quick emails

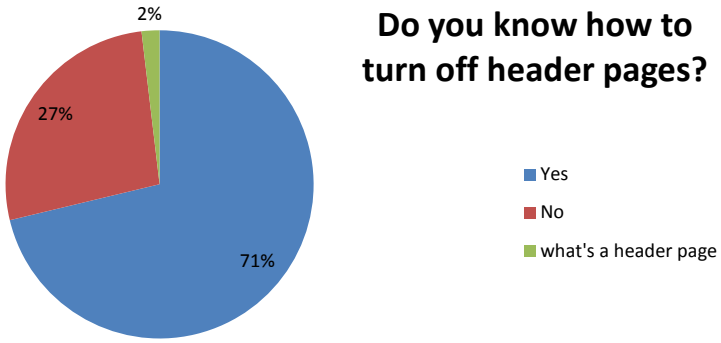

Do you own a Laptop?
1%
99%
Yes
No

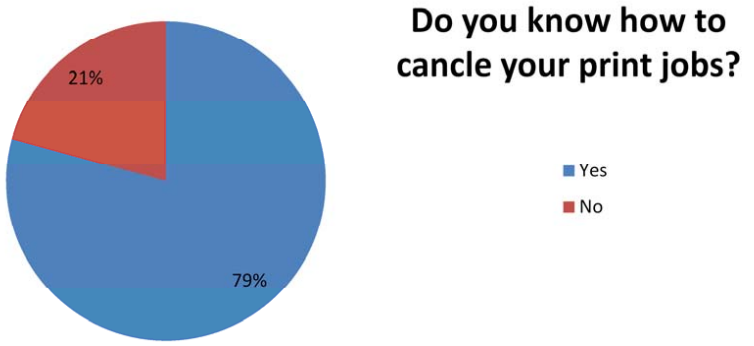

Bring Laptop to Class?
Never, 279
Always, 279
Most of the time, 337
Sometimes, 621

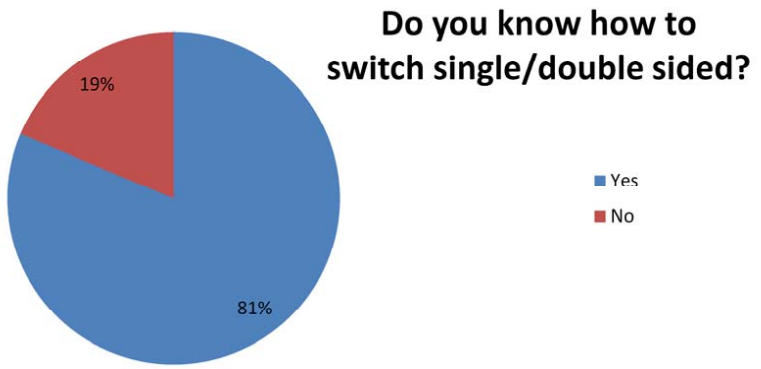

Why do you not bring your laptop to class?
900
800
700
600
500
400
300
200
100
0
847
601
434
531
155
Too big/heavy
Short battery life
No available power outlets
Risk of loss or damage
Other (write in)
(Select all that apply)

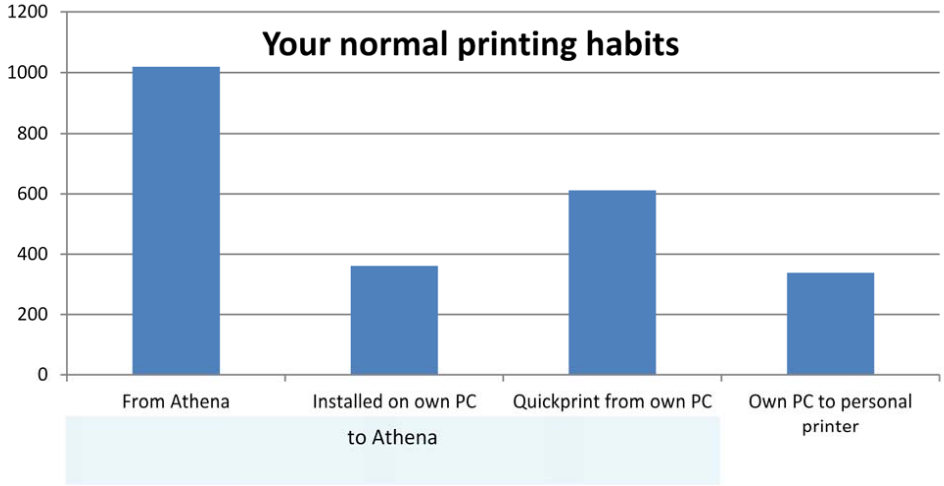

What other devices do you own?
350
300
250
200
150
100
50
0
151
223
128
294
2
Second laptop
Monitor for laptop
Desktop computer
Smartphone or other hand-held, wifi-enabled device
None of these
(Select all that apply)


Are header pages useful?
2%
43%
55%
Yes
No
what's a header page

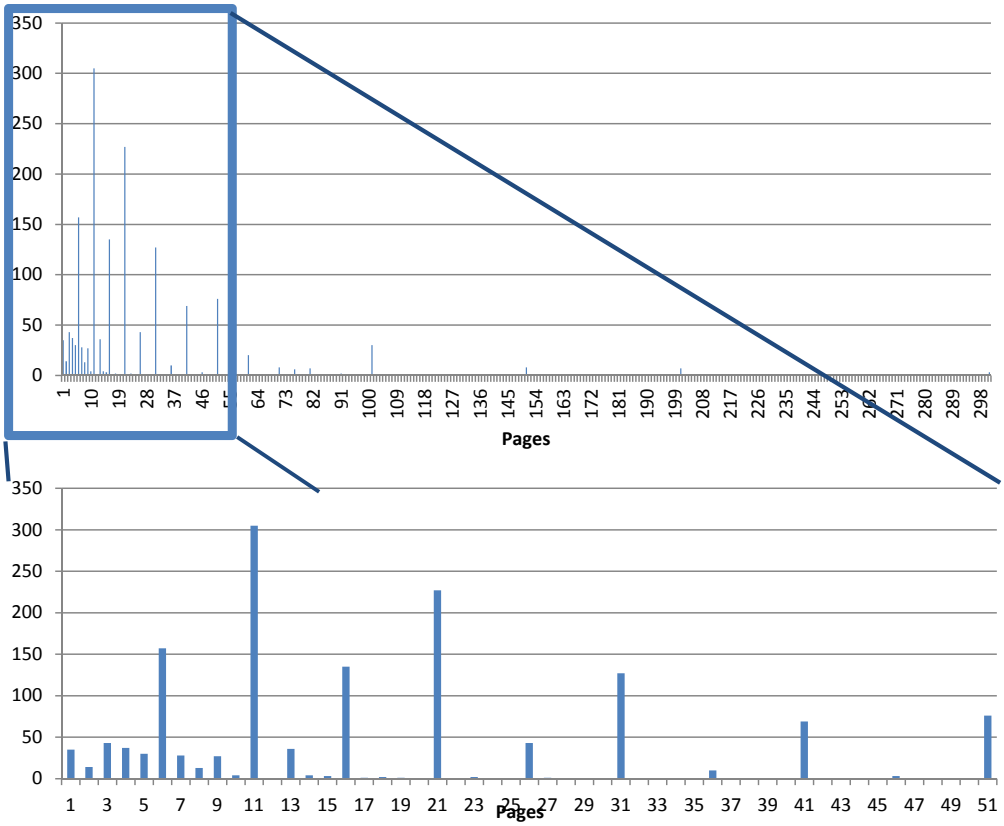

Do you know how to turn off header pages?
2%
27%
71%
Yes
No
what's a header page

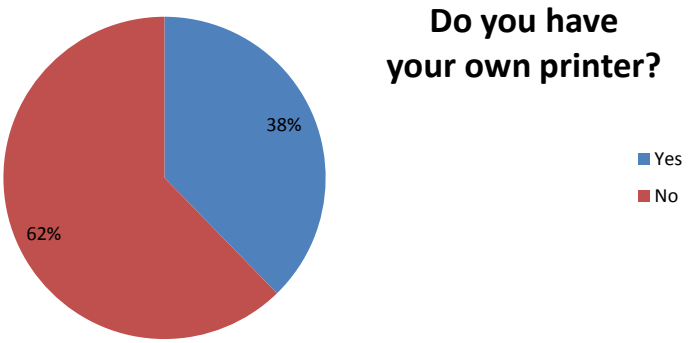

Do you know how to cancle your print jobs?
21%
79%
Yes
No

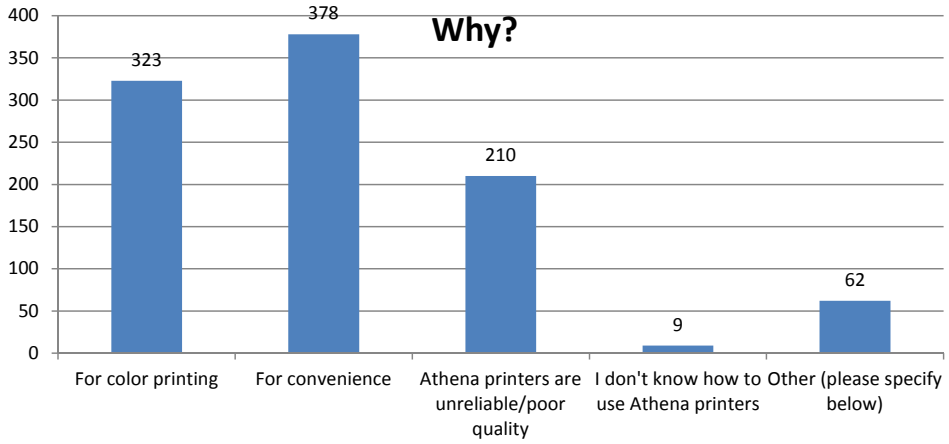

Do you know how to switch single/double sided?
19%
81%
Yes
No


Your normal printing habits
1200
1000
800
600
400
200
0
From Athena
Installed on own PC to Athena
Quickprint from own PC
Own PC to personal printer

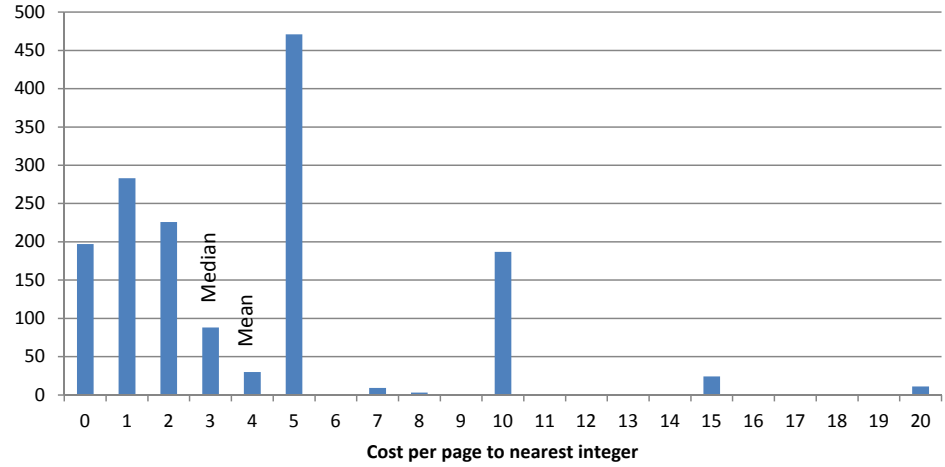
How many pages do you print for class every week?



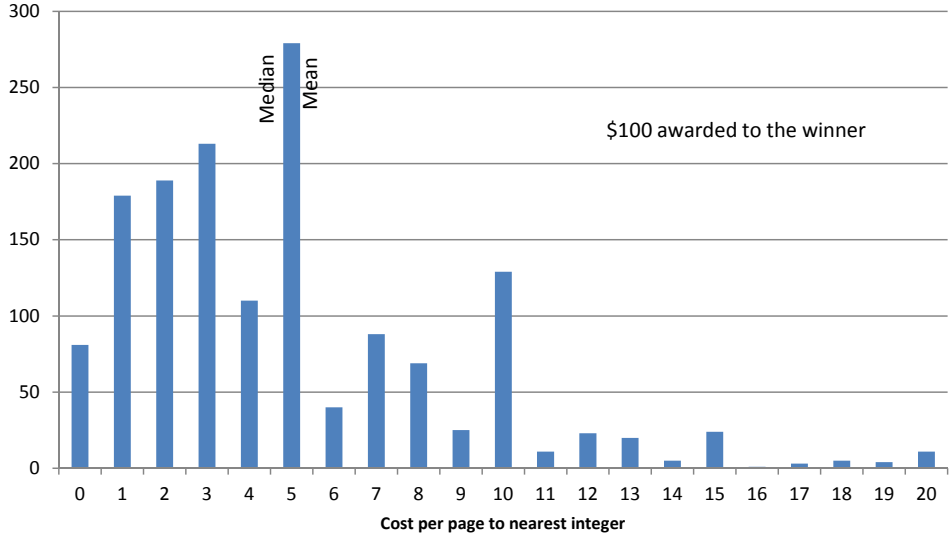

Do you have your own printer?
38%
62%
Yes
No

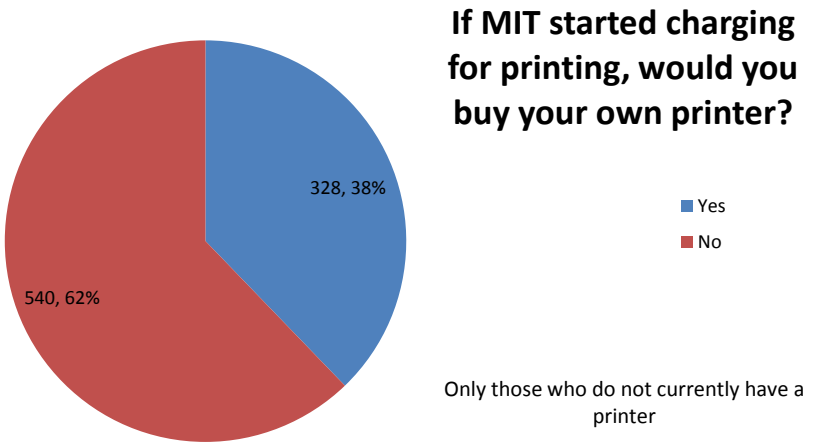

Why?
400
350
300
250
200
150
100
50
0
323
378
210
9
62
For color printing
For convenience
Athena printers are unreliable/poor quality
I don't know how to use Athena printers
Other (please specify below)

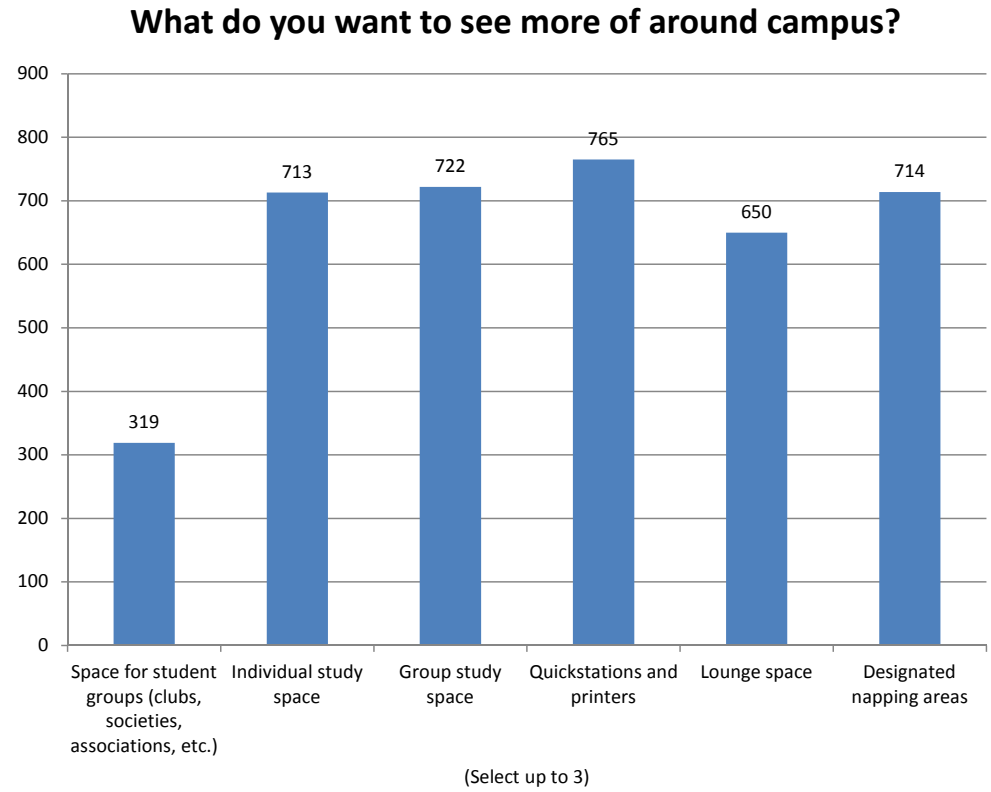
If MIT charged students for printing more than a reasonable number of pages per semester, how many cents per extra page would be fair?



Estimate the average value of all responses to the previous question.




If MIT started charging for printing, would you buy your own printer?
328, 38%
540, 62%
Yes
No
Only those who do not currently have a printer


What do you want to see more of around campus?
900
800
700
600
500
400
300
200
100
0
319
713
722
765
650
714
Space for student groups (clubs, societies, associations, etc.)
Individual study space
Group study space
Quickstations and printers
Lounge space
Designated napping areas
(Select up to 3)