Mobile Sensors

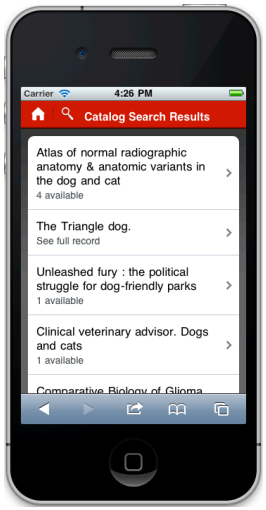
Building a staff-facing tablet application for library assessment

Jason Casden
North Carolina State University Libraries
NISO Forum: Mobile Technologies in Libraries
May 20, 2011

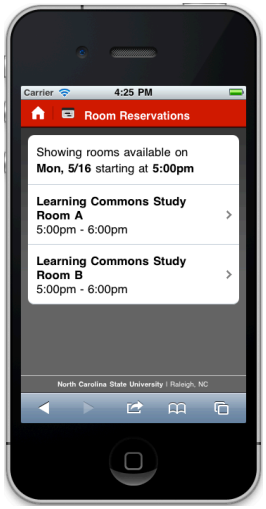
Mobilized library services

Mobilized library services

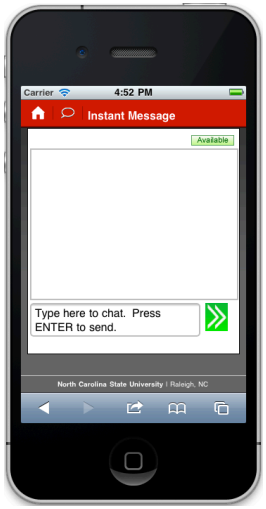
Mobilized library services



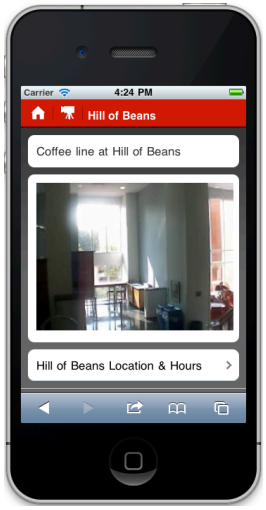
Mobilized library services



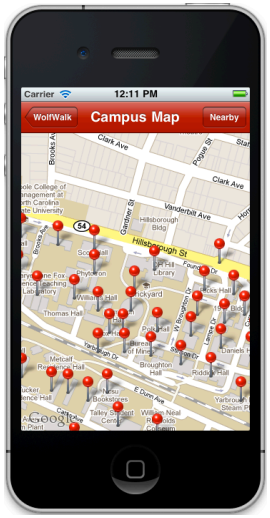
Mobilized library services

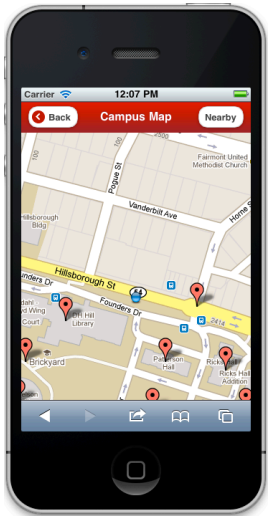


Mobilized library services



Mobile-enabled library services





Indirect mobile-enabled services

Problem statement

- Many libraries perform manual counts of people in spaces doing something at some time
- The process involves tedious collection mechanisms, lots of paperwork, and much room for error
- There is no coordinated effort to help departments analyze their data

Our solution

An open source tablet-based app (well, toolkit) to aid library staff in assessment of how patrons are using library spaces.

In other words…the gathering, storing, exporting, analyzing, and visualizing of data across spaces/activities/time and around events.

Why do we care?

With data about use/activity patterns in different library spaces we can

- Improve staffing models
- Make informed purchasing decisions (technology, furniture)
- Arrange space (quiet study, collaborative)
- Take an evidence-based approach to planning future library spaces

Related work

- James B. Hunt, Jr. Library planning
- IMLS Learning Spaces grant

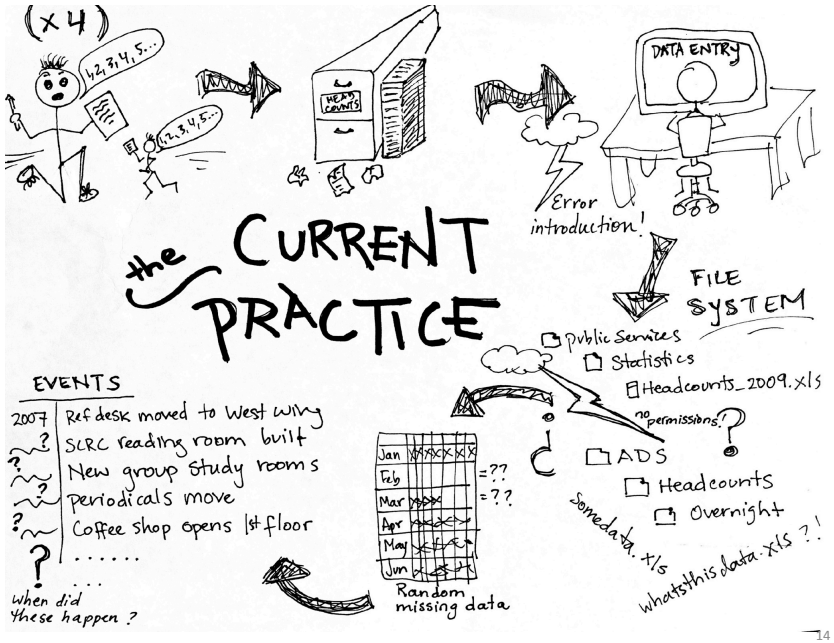


Illustration by Joyce Chapman

Activity tracking

- Are some spaces more conducive to group study or individual study?
- What's the ratio of usage of laptops versus public computers versus no computers?
- Do changes to space components change the type of usage?

Noon Head Count

		2/21/2011 Mon	2/22/2011 Tues	2/23/2011 Wed	2/24/2011 Thurs	2/25/2011 Fri	2/26/2011 Sat	2/27/2011 Sun
	Ground Floor	93	71	139	105	79	15	20
	Lobby and Mezzanine	35	35	47	58	56	13	16
Tower/ Stacks	9th Floor	29	32	51	50	31	7	18
	8th Floor	38	28	59	29	34	3	8
	7th Floor	51	38	42	31	14	5	13
	6th Floor	42	47	48	46	30	9	6
	5th Floor	42	29	41	33	37	12	11
	4th Floor	42	49	42	43	23	[illegible]	10
	3rd Floor	38	35	46	35	26	15	15
	2nd Floor	42	27	40	33	29	16	10
	Unity Lab	28	28	35	23	21	6	1
East Wing	Spec. Coll. Reading Rm.	39	31	41	25	28	15	19
	Digital Media Lab	18	13	21	13	18	4	85
	1st Floor	220	205	240	221	269	42	73
	2nd Floor	17	26	22	29	14	2	3
West Wing	Techonlogy Sandbox	15	7	17	8	16	3	2
	Quiet Reading Room	55	48	67	60	51	6	10
	1st Floor	28	20	59	39	34	2	0
	2nd Floor	10	5	16	12	6	0	3
	Total	882	808	1060	903	816	196	245
	Initials	CG	ES	EE	ECB	EBG	LG	ECB

Definitions:
Lobby and Mezzanine: study tables on balcony, sitting area in front of circ, print/copy/scan/room, hallway surrounding circ
1st Floor East Wing: computer area, couches, study rooms, presentation practice room
Ground Floor: reading room, guest computers, Hill of Beans, entryway, express desk
2nd Floor East Wing: Does not include classroom/office spaces like ITTC labs
2nd Floor West Wing: Does not include classroom/office spaces like auditorium and mini-theater

Security Patrol Head Count

Date: 5/3/11

		10:00PM	12:00AM	2:00AM	4:00AM
	Ground Floor		33	11	16
	Lobby and Mezzanine				
Tower/ Stacks	9th Floor				
	8th Floor				
	7th Floor				
	6th Floor				
	5th Floor				
	4th Floor				
	3rd Floor				
	2nd Floor				
	Unity Lab				
East Wing	Spec. Coll. Reading Rm.				
	Digital Media Lab				
	1st Floor (Commons)				
	2nd Floor				
West Wing	Technology Sandbox				
	Quiet Reading Room				
	1st Floor				
	2nd Floor				
	Total				
	Patrol (initials)				

Definitions:
Lobby and Mezzanine: study tables on balcony, sitting area in front of circ, print/copy/scan/room, hallway surrounding circ
1st Floor East Wing: computer area, couches, study rooms, presentation practice room
Ground Floor: reading room, guest computers, Hill of Beans, entryway, express desk
2nd Floor East Wing: Does not include classroom/office spaces like ITTC labs
2nd Floor West Wing: Does not include classroom/office spaces like auditorium and mini-theater

Computer = Computer, laptop use
SMART = SMART Board use
MSurace = Microsoft Surface use
Pixel = Perceptive Pixel use
4screen = QuadScreen Projecting use
Gaming = Gaming (XBox, PS3, Wii)
Other = Other (Socializing, Reading, eating etc.)

INDIVIDUAL	Computer	SMART	MSurface	Pixel	4screen	Gaming	Other
Total#							

DML Observation

INSTRUCTIONS: Tally the activities people are doing on their own using the designated codes below. If people are working in a group, tally them in the 'group' column, and circle each group (example: (II) (IIII)).

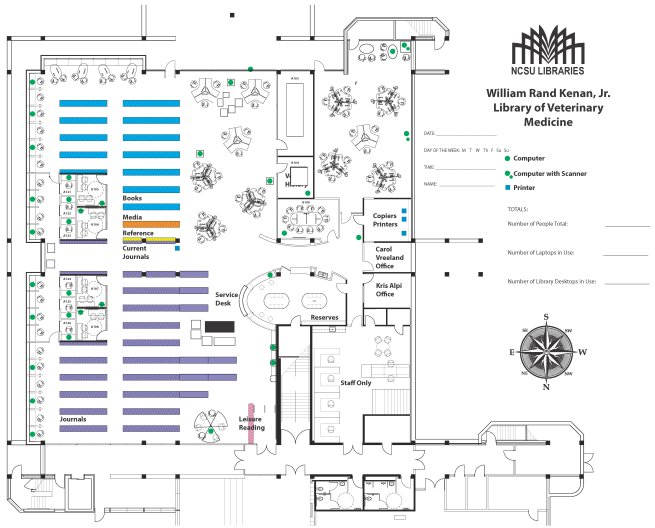
M = Multimedia creation (photo/video editing, video importing/conversion, other multimedia work)
T = Touchscreen use: USING TOUCHSCREEN FUNCTIONALITY (Lenovo PCs)
S = Scanning (Document and book scanning, negative/slide scanning)
C = General Computing (Social Networking, word processing, web-browsing, email, chat, etc.)

Activity	# of ppl Alone	# of ppl in Group (Circle each group)
M	III	(II)
T	I	
S	HHII	
C	III	(II)

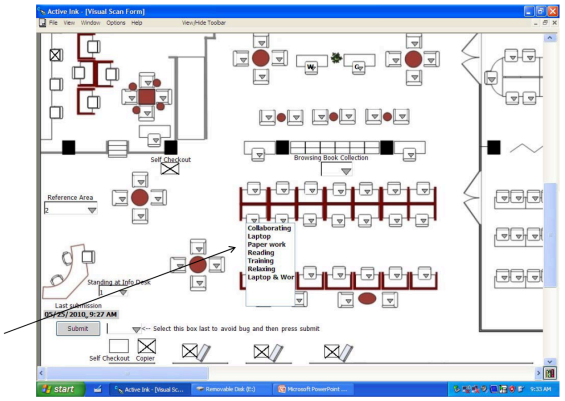
DATE: 04/12/11
TIME: 2:30
STAFF: EBG

NOTES (Interesting activity, use of technology, etc.):

- Large Batch Scan of Slides
- Audacity/Sound Mixing
- Scanning 35mm Film (used Epson Scanning w/ Padding taken off)



NIH Library project



This is a screenshot of the tool on the touch-screen laptop. The drop-down menu has the options for recording the activities.

Hope, Benjamin, and Bradley Otterson. "Visualize the Activity in the Library with Data." *In Annual Meeting of the Medical Library Association*. Washington, DC, 2010.

Staff as sensors

Joyce Chapman: librarian, project team member, slide contributor, wireframer, data analyst, illustrator.

Data analysis

- Fragmented data
- Decentralized data storage
- Uncontrolled vocabularies

=

High barriers to analysis and data reuse

Two-part project

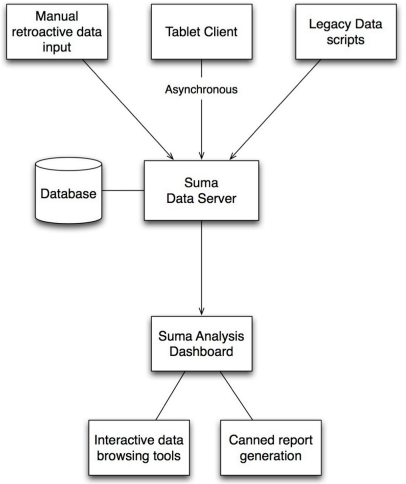
1. Address a current need: improve ease of data collection and reporting for our current headcount practices

2. Expand to new areas of interest (activity counts, analysis and visualization, data importing/exporting) and share the tool

Goal: to encourage an evidence-based approach to physical spaces

Working Title: Suma

What is the system?



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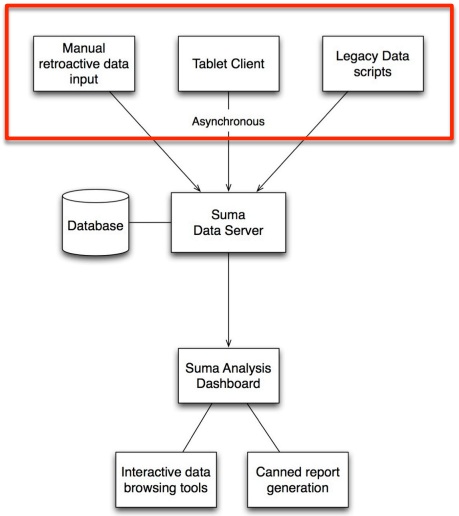

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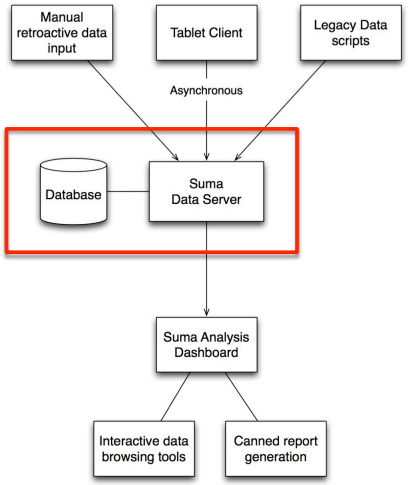

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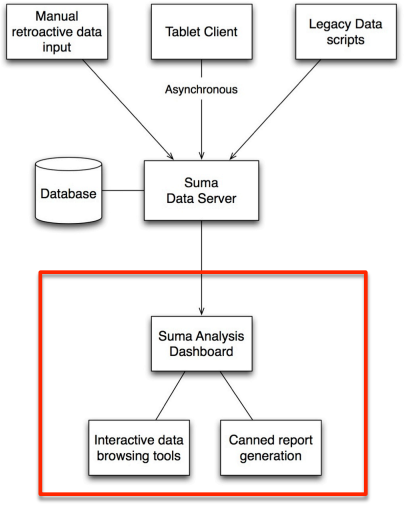
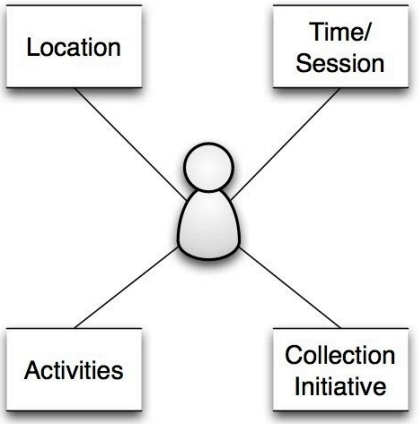


What is the data?



How are we starting?

- Headcounts
  - Focus on improving existing practices
- Client-first development
  - To make sure it will work
  - Strict user requirements

Some requirements

- Very high interface responsiveness
- Accommodate uneven network access
- Support future expansion to activity counts
- Open Source release

Why web-based?

- Multi-platform support
  - Rapid expansion of tablet market
- Open source release
  - Difficulty in deploying native iPad applications
    - Licenses, ad-hoc deployment pains, etc.
- Encourage community use and contributions
- Design doesn't preclude multiple clients in the future

Why not web-based?

- Interface performance/responsiveness is crucial
- Handling uneven Wi-Fi coverage
- Data stability

How to resolve this?

- Browser database
- Asynchronous data aggregation
- touchstart/touchmove/touchend events

Browser storage

- SQLite
  - Web SQL Database
  - Google Gears
- Indexed Database API (Indexed DB)
- HTML5 Storage (localStorage)

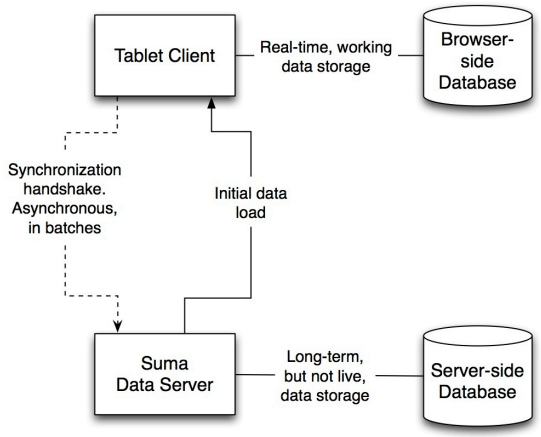
Web SQL

- Possibly soon to be obsolete
  - http://www.w3.org/TR/webdatabase/
  - 18 November 2010: “This document was on the W3C Recommendation track but specification work has stopped. The specification reached an impasse: all interested implementors have used the same SQL backend (Sqlite), but we need multiple independent implementations to proceed along a standardisation path.”
  - Gears end of life plans announced 19 February 2010
- Why?
  - It works now
    - WebKit support (for now)
      - iOS, Android

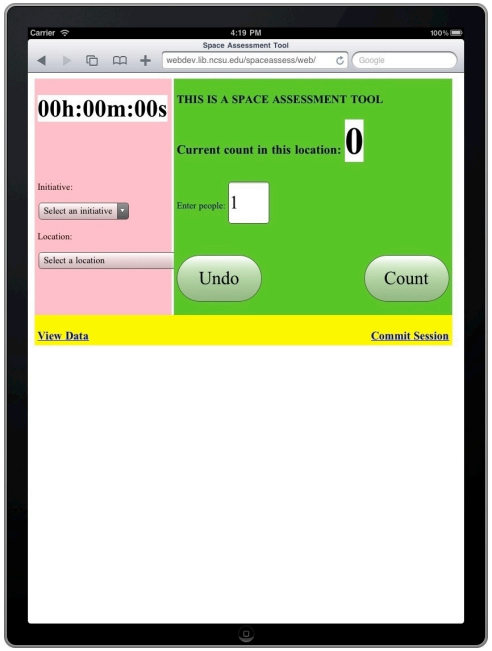
persistence.js

```
var Session = persistence.define('Session', {
    startTime: "DATE",
    collectionLength: "INT”
});

var Person = persistence.define('Person', {
    timestamp: "DATE"
});

Session.hasMany('people', Person, 'session');
```


Data synchronization



Design iterations


Carrier
4:19 PM
100%
Space Assessment Tool
webdev.lib.ncsu.edu/spaceassess/web/
Google
00h:00m:00s
THIS IS A SPACE ASSESSMENT TOOL
Current count in this location: 0
Initiative:
Select an initiative
Location:
Select a location
Enter people: 1
Undo
Count
View Data
Commit Session

41


Carrier
4:39 PM
100%
Space Assessment Tool
webdev.lib.ncsu.edu/spaceassess/web/
Google
Undo last count
Current count in this location: 0
Initiative:
Select an initiative
Location:
D. H. Hill Library
East Wing
Pick a child
Enter people: 1
Count
View Data
Commit Session

42

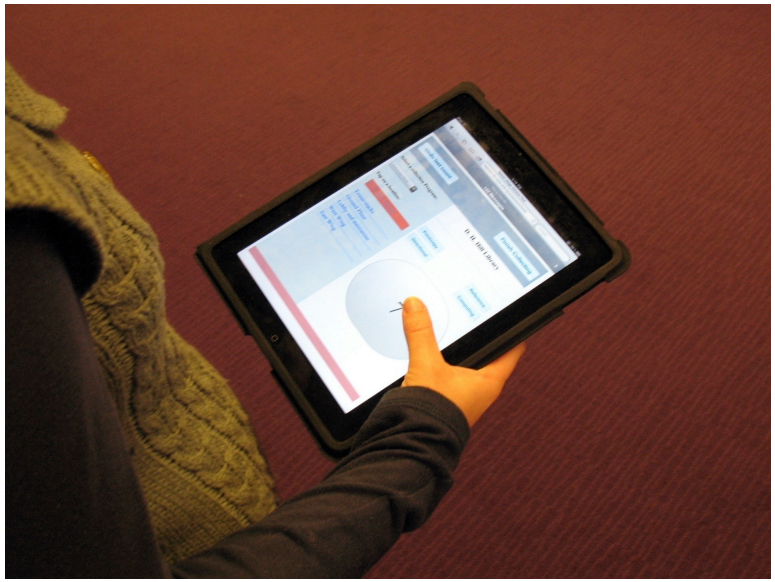

Carrier
4:16 PM
100%
Space Usage Census Tool
webdev.lib.ncsu.edu/spaceassess/web/
Google
Undo last count
Finish Collecting
Select a collection Program:
Headcounts
Tap on a location:
D. H. Hill Library
Tower/stacks
Ground Floor
Lobby and mezzanine
West Wing
East Wing
Unity lab
2nd floor
3rd floor
4th floor
5th floor
6th floor
7th floor
8th floor
9th floor
D. H. Hill Library | Tower/stacks | 2nd floor
3

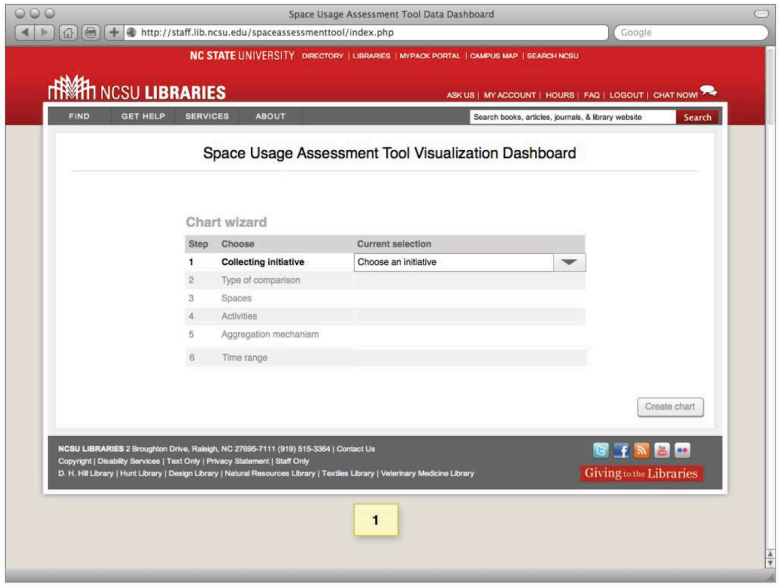
43


Carrier
4:16 PM
100%
Space Usage Census Tool
webdev.lib.ncsu.edu/spaceassess/web/
Google
Undo last count
Finish Collecting
Select a collection Program:
Headcounts
Tap on a location:
D. H. Hill Library
Tower/stacks
Ground Floor
Lobby and mezzanine
West Wing
East Wing
Unity lab
2nd floor
3rd floor
4th floor
5th floor
6th floor
7th floor
8th floor
9th floor
D. H. Hill Library | Tower/stacks | 2nd floor
3

44

What are we trying to replace?

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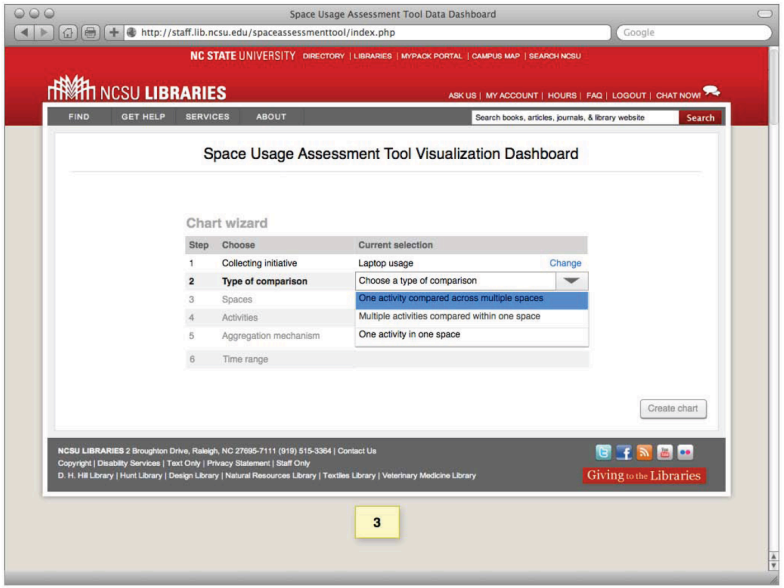
http://staff.lib.ncsu.edu/spaceassessmenttool/index.php
NC STATE UNIVERSITY
NCSU LIBRARIES
Space Usage Assessment Tool Visualization Dashboard
Chart wizard
Step
Choose
Current selection
1 Collecting initiative
Choose an initiative
2 Type of comparison
3 Spaces
4 Activities
5 Aggregation mechanism
6 Time range
Create chart
Giving to the Libraries
1

49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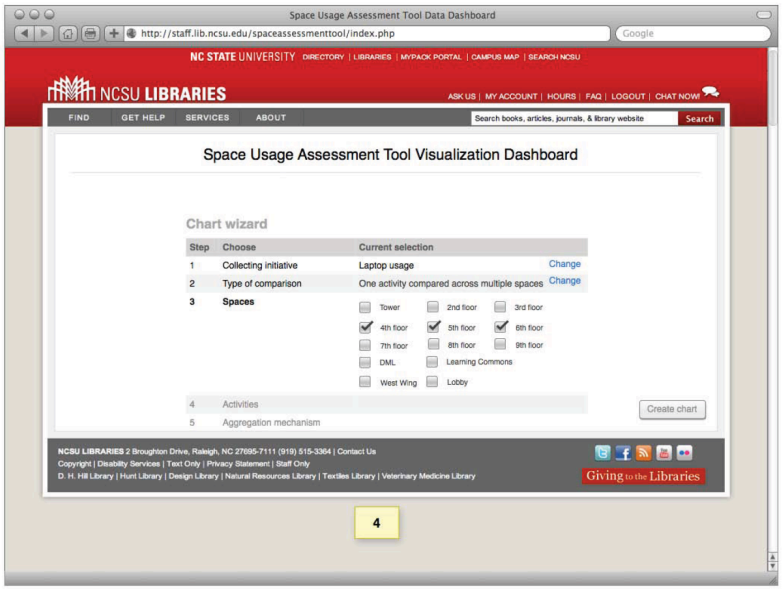
NC STATE UNIVERSITY
NCSU LIBRARIES
Space Usage Assessment Tool Visualization Dashboard
Chart wizard
Step
Choose
Current selection
1 Collecting initiative
Laptop usage
Change
2 Type of comparison
Choose a type of comparison
One activity compared across multiple spaces
Multiple activities compared within one space
One activity in one space
3 Spaces
4 Activities
5 Aggregation mechanism
6 Time range
Create chart
Giving to the Libraries
3

50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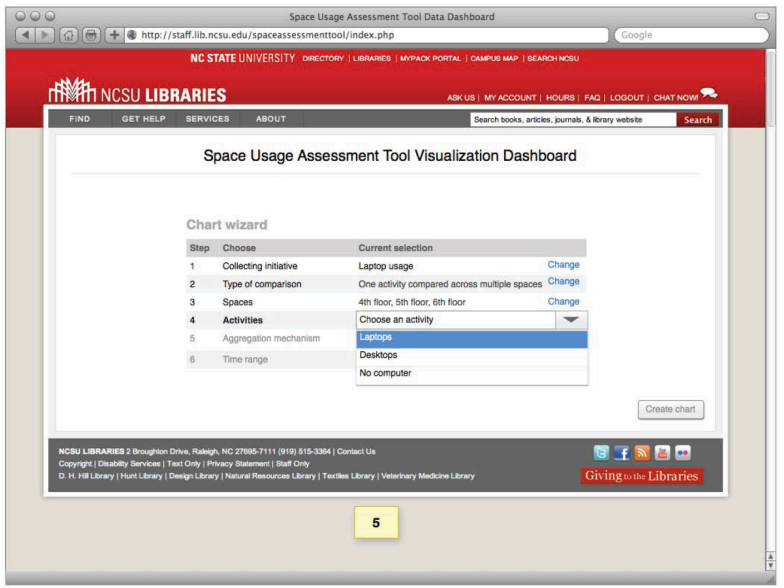
NCSU LIBRARIES
Space Usage Assessment Tool Visualization Dashboard
Chart wizard
Step
Choose
Current selection
1 Collecting initiative
Laptop usage
Change
2 Type of comparison
One activity compared across multiple spaces
Change
3 Spaces
Tower
2nd floor
3rd floor
4th floor
5th floor
6th floor
7th floor
8th floor
9th floor
DML
Learning Commons
West Wing
Lobby
4 Activities
5 Aggregation mechanism
Create chart
Giving to the Libraries
4

51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NCSU LIBRARIES
Space Usage Assessment Tool Visualization Dashboard
Chart wizard
Step
Choose
Current selection
1 Collecting initiative
Laptop usage
Change
2 Type of comparison
One activity compared across multiple spaces
Change
3 Spaces
4th floor, 5th floor, 6th floor
Change
4 Activities
Choose an activity
Laptops
Desktops
No computer
5 Aggregation mechanism
6 Time range
Create chart
Giving to the Libraries
5

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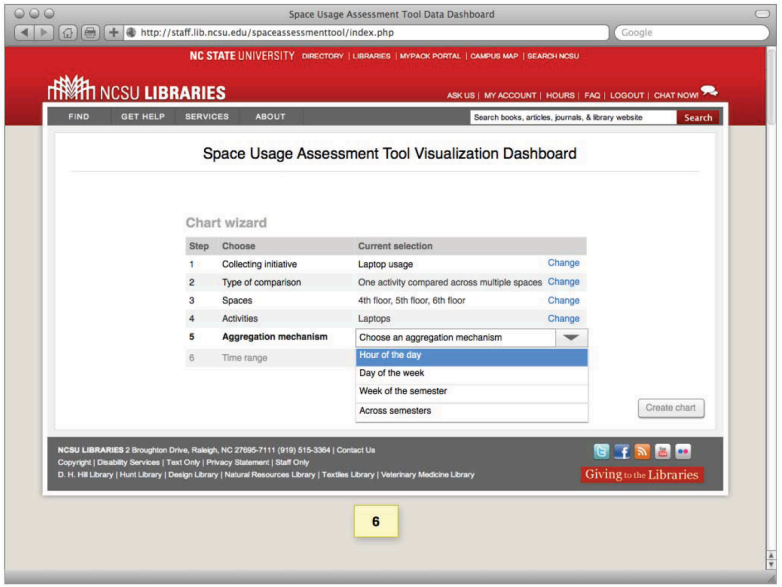
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NCSU LIBRARIES
Space Usage Assessment Tool Visualization Dashboard
Chart wizard
Step
Choose
Current selection
1 Collecting initiative Laptop usage Change
2 Type of comparison One activity compared across multiple spaces Change
3 Spaces 4th floor, 5th floor, 6th floor Change
4 Activities Laptops Change
5 Aggregation mechanism Choose an aggregation mechanism
6 Time range
Hour of the day
Day of the week
Week of the semester
Across semesters
Create chart
Giving to the Libraries
6

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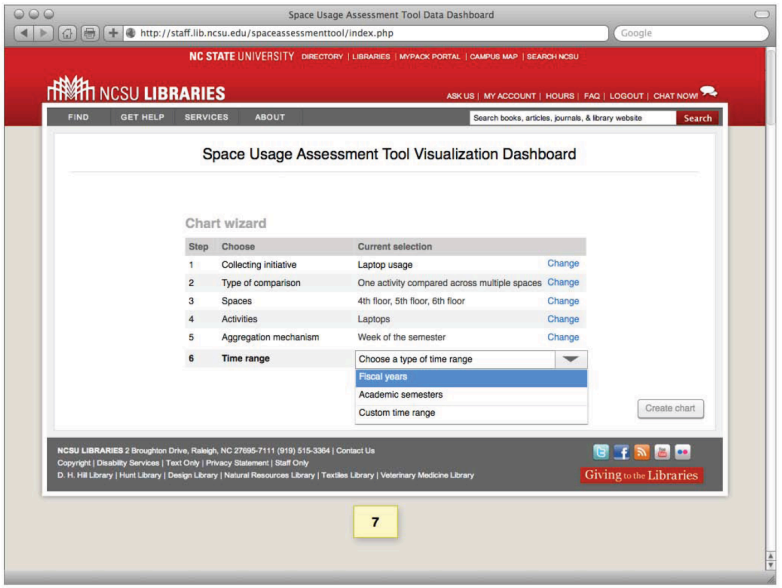
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NCSU LIBRARIES
Space Usage Assessment Tool Visualization Dashboard
Chart wizard
Step
Choose
Current selection
1 Collecting initiative Laptop usage Change
2 Type of comparison One activity compared across multiple spaces Change
3 Spaces 4th floor, 5th floor, 6th floor Change
4 Activities Laptops Change
5 Aggregation mechanism Week of the semester Change
6 Time range Choose a type of time range
Fiscal years
Academic semesters
Custom time range
Create chart
Giving to the Libraries
7

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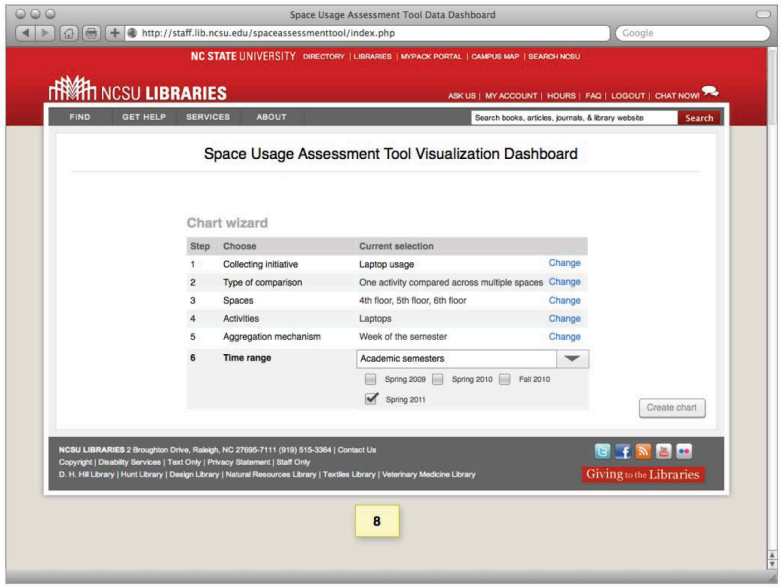
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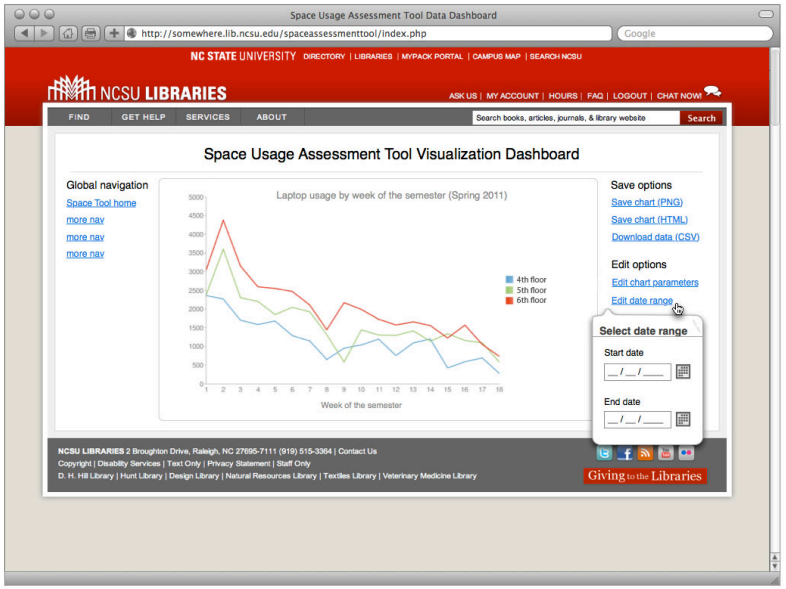
NCSU LIBRARIES
Space Usage Assessment Tool Visualization Dashboard
Chart wizard
Step
Choose
Current selection
1 Collecting initiative Laptop usage Change
2 Type of comparison One activity compared across multiple spaces Change
3 Spaces 4th floor, 5th floor, 6th floor Change
4 Activities Laptops Change
5 Aggregation mechanism Week of the semester Change
6 Time range Academic semesters
Spring 2009 Spring 2010 Fall 2010
Spring 2011
Create chart
Giving to the Libraries
8

55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NC STATE UNIVERSITY
NCSU LIBRARIES
Space Usage Assessment Tool Visualization Dashboard
Global navigation
Space Tool home
more nav
more nav
more nav
Laptop usage by week of the semester (Spring 2011)
4th floor
5th floor
6th floor
Week of the semester
Save options
Save chart (PNG)
Save chart (HTML)
Download data (CSV)
Edit options
Edit chart parameters
Edit date range
Select date range
Start date
End date
Giving to the Libraries

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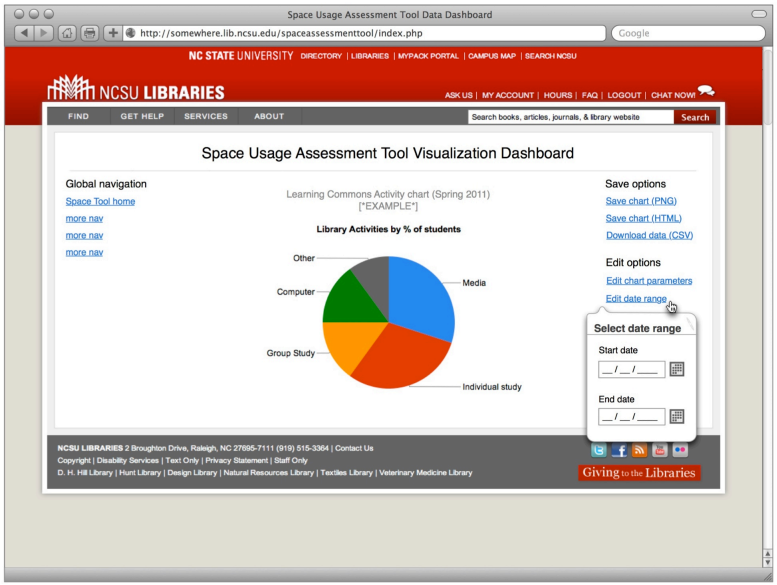
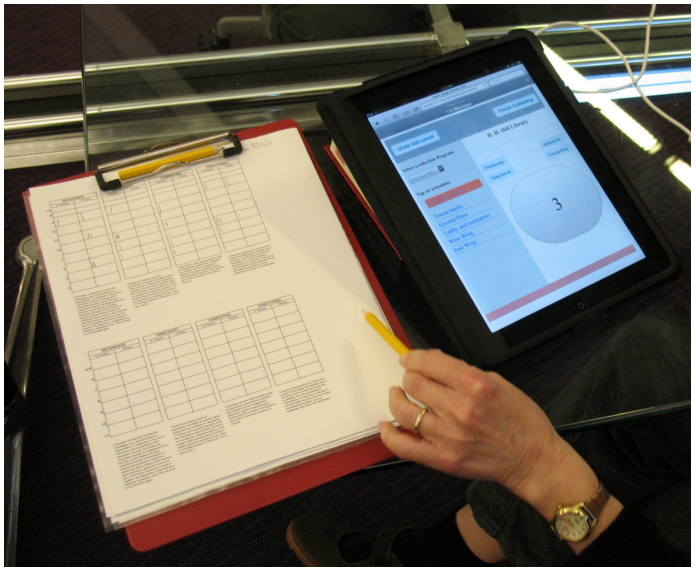
Future directions

- Open Source release: Late summer 2011
- Legacy data
- Build analysis dashboard tools
- Activity counts
  - Reference transactions
  - Subjective/Observational space usage data
  - Grant assessment





Project team

- Jason Casden
- Joyce Chapman
- Rob Rucker
- Hill Taylor
- Eric McEachern
- Rusty Earl

Thanks!

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jason_casden@ncsu.edu
@cazzerson

https://github.com/cazzerson/Suma
http://www.lib.ncsu.edu/dli/projects/spaceassesstool