Space Utilization
Not just for classrooms anymore

Annie Newman
Bob Boes
Who’s heard this?

- Campus research space is significantly overcrowded.
- I’m sure that <your choice here> is hoarding space.
- We just build two buildings; how can we be out of space?
- We can solve this if we tighten space standards.
- Why can’t we use old warehouse for the neuroscience grant?
The strategic view

- Identify your institution’s strategic business goals, e.g.
  - Enrollment
  - Research direction
  - Strategic academic plans
  - Capital project strategy

- Relate space analysis specifically to those goals

- Where do you have leverage to further those goals?
  - Labs
  - Offices
What can you really work with?

<table>
<thead>
<tr>
<th>Gross Square Feet (GSF)</th>
<th>Net Usable Square Feet (NUSF)</th>
<th>Non-Assignable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Net Assignable Square Feet (NASF)</td>
<td>Building Services</td>
</tr>
<tr>
<td>Classrooms</td>
<td>Offices</td>
<td>Laboratories</td>
</tr>
</tbody>
</table>

Introduction
Leverage

Data taken from a study of 76 Colleges and Universities with enrollments less than 6,000 students.

Introduction

Data taken from a benchmark of 13 doctoral/research institutions ranging from 3.4M – 12M GSF.
Narrow the focus further

- Some lab space is relatively untouchable…
  - Teaching Labs
  - Research Labs
  - Open Labs
  - Highly specialized spaces (e.g. clean rooms, FMRI suites)
  - Undergraduate vs. Graduate

- Offices
  - Physical Reality vs. Guidelines
What do you need to really manage your space?

- Accurate, complete, consistent data
- Utilization metrics
- Continuous space analysis
- Supportive space policies
- Integrated space, academic, & capital planning
Assess Current Situation
Building a space inventory

- Analyze best sources of information (finance, HR, IT, security, plant operations...)
- Assignable space first – consider residential life and athletics last
- Create a plan that produces results and build on it over time
- Partner with departments that have money to spend
- It’s not rocket science – start with simple spreadsheets and move to CAFM when the time is right
- Determine the best group to own and maintain the data and drawings
Facilities Inventory and Classification Manual (FICM)

US Dept. of Education National Center for Education Statistics (NCES)

- Basic Principals
- Room Type Definitions
- Room Use Codes
- Function Taxonomy
- Area Measurement Standards

Free download from NCES:

Assess Current Situation
Refrining room types

- What have you really got?
- FICM definitions can and should be adapted
- Consider finer room type definitions or additional descriptive fields:

<table>
<thead>
<tr>
<th>Offices</th>
<th>Wet Labs</th>
<th>Teaching Labs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty:</td>
<td>In Vitro (cells, tissue)</td>
<td>Wet sciences</td>
</tr>
<tr>
<td>Tenure track</td>
<td>In Vivo (live animals)</td>
<td>Dry sciences</td>
</tr>
<tr>
<td>Visiting</td>
<td>Chemical</td>
<td>Social sciences</td>
</tr>
<tr>
<td>Adjuncts</td>
<td>Computationa</td>
<td>Art studios</td>
</tr>
<tr>
<td>Emeriti</td>
<td>Imaging</td>
<td>Music classrooms</td>
</tr>
<tr>
<td>Senior Administration</td>
<td>Cognitive</td>
<td>Dance studios</td>
</tr>
<tr>
<td>Professional Staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clerical Staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical Staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Employees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Organizations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Core Labs</td>
<td>Shared space,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>often equipment-intensive</td>
<td></td>
</tr>
</tbody>
</table>
Examples of basic analysis

- Square footage by room type, department, building
- Average areas by room type, department, building
- PI research area / number of staff reporting to PI
- Research revenue per square foot (caution)
- Rolling window: reno expenditures / replacement value
Educate your community

- Often very different perspectives
  - The Principal Investigator
  - The local space banker (dean, dept. head)
  - The desperate planner
  - The federal auditing agency
- Assigned space vs. available space
- Highest-best use
- The limits of planning standards
- Why the request and allocation process is critical
Highest-best use of rooms

- All square feet (meters) are not created equal
- Rooms evolve over time
- Differentiate “as-designed,” “as-used,” and “best use”
- Align the institutional direction with hard inventory facts
Utilization Management

- Search for quick, low cost opportunities
- Understand and document unassigned & underutilized space
- Develop quick metrics based on:
  - A space planner’s view
  - A federal auditor’s view (audits getting tougher)
- Conduct annual room-by-room audits
Types of Metrics

- Benchmarking
- Planning standards
- State guidelines
- Institutional standards
Benchmarking

- Value vs. effort
- The difficulty of obtaining data
- Apples vs. oranges
- Be cautious about self-reported data
- Know how participant data was collected and cleaned
Comparing against benchmarking

Metrics
# Planning standard examples

<table>
<thead>
<tr>
<th>Planning Standard Examples</th>
<th>Use</th>
<th>Additional sorts</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>NASF / person</td>
<td>lab, office</td>
<td>department, school</td>
<td></td>
</tr>
<tr>
<td>NASF / rank or position</td>
<td>office</td>
<td>department, school</td>
<td></td>
</tr>
<tr>
<td>NASF / Principal Investigator</td>
<td>lab, office</td>
<td>department, school</td>
<td></td>
</tr>
<tr>
<td>Research $ / NASF</td>
<td>lab</td>
<td>PI, department, school (check IR)</td>
<td>caution</td>
</tr>
<tr>
<td>Lab NASF / occupant</td>
<td>lab</td>
<td>lab type, type of science</td>
<td></td>
</tr>
<tr>
<td>(Lab NASF / person) / Research $</td>
<td>lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time utilization (seats, week hours)</td>
<td>lab</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class lab seats / students</td>
<td>lab</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Relative cost of tightening planning standards

- High cost / foot unless done in context of major renos
- Long time-frame
- Can have a high political cost
- Offices and labs offer far more leverage than classrooms
- Facilities may already be tightening standards in new projects
# Migrating Office Space Standards

<table>
<thead>
<tr>
<th>Assignable Square Footage</th>
<th>Proposed Guidelines</th>
<th>Square Footage Range</th>
<th>Administrative Portfolios</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200</td>
<td>NA</td>
<td>200-300</td>
<td>NA</td>
</tr>
<tr>
<td>1000</td>
<td>NA</td>
<td>150-200</td>
<td>NA</td>
</tr>
<tr>
<td>800</td>
<td>NA</td>
<td>100-150</td>
<td>NA</td>
</tr>
<tr>
<td>600</td>
<td>NA</td>
<td>50-100</td>
<td>NA</td>
</tr>
<tr>
<td>400</td>
<td>NA</td>
<td>40-50</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Metrics**

- [Colorado Intersate Commission for Higher Education (CICHE)]. Standards used in the Facilities Inventory and Classification Manual (FICM) published by the U.S. Department of Education. [CC BY]
Comparing against typical values

Total NSF by Space Use
Total NSF = 189,961

Classrooms: typically @15% of non-residential space
Class labs: 16,036 NSF, 8.44%; typically @15% of non-residential space
Offices: typically @25% of non-residential space
# State guidelines

### Office Space Standards

*(for analysis purposes, upper value used when ranges given)*

<table>
<thead>
<tr>
<th>Role</th>
<th>Arkansas</th>
<th>Cal State Stanislaus</th>
<th>Central Conn State</th>
<th>Colorado-Boulder</th>
<th>Cornell</th>
<th>CPHE</th>
<th>Dalhousie</th>
<th>Georgetown</th>
</tr>
</thead>
<tbody>
<tr>
<td>President</td>
<td>300</td>
<td>180</td>
<td>150</td>
<td>200</td>
<td>400</td>
<td>320</td>
<td>301</td>
<td>600</td>
</tr>
<tr>
<td>VP/Dean</td>
<td>200</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>200</td>
<td>129</td>
<td>193</td>
<td>350</td>
</tr>
<tr>
<td>Assist/Assoc Dean/VP</td>
<td>180</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>129</td>
<td>193</td>
<td>150</td>
<td>250</td>
</tr>
<tr>
<td>Academic Dept Head</td>
<td>180</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>200</td>
<td>118</td>
<td>150</td>
<td>200</td>
</tr>
<tr>
<td>Nonacademic dept head</td>
<td>180</td>
<td>150</td>
<td>150</td>
<td>150</td>
<td>160</td>
<td>118</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Faculty</td>
<td>135</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>160</td>
<td>150</td>
<td>118</td>
<td>150</td>
</tr>
<tr>
<td>Administrator/Prof Staff</td>
<td>135</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>120</td>
<td>150</td>
</tr>
<tr>
<td>GA</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>50</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>56</td>
</tr>
<tr>
<td>Clerical</td>
<td>90</td>
<td>80</td>
<td>120</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Office Support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Metrics
## Comparing against planning guidelines

<table>
<thead>
<tr>
<th>Space Use</th>
<th>Space Use Code</th>
<th>Actual existing ASF</th>
<th>Calculated ASF for Fall 2006</th>
<th>Calculated ASF for Fall 2012 Projection</th>
<th>CEFPI formula used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open Lab.</td>
<td>220, 225, 235</td>
<td>6.411</td>
<td>8.869</td>
<td>10.006</td>
<td>ASF = \text{Space Factor} \times \text{Fall FTE}</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASF = 4.9 \times 1,310</td>
</tr>
<tr>
<td>Research Lab.</td>
<td>250, 255</td>
<td>243.657</td>
<td>305,600</td>
<td>385,200</td>
<td>ASF = \text{Space Factor} \times FTEF</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASF = 400 \times 764</td>
</tr>
<tr>
<td>Office &amp; Conf.Room</td>
<td>310, 315 &amp; 350, 355</td>
<td>606.061</td>
<td>446.590</td>
<td>502.275</td>
<td>ASF = \text{Space Factor} \times (FTE Faculty &amp; Staff Requiring an office)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASF = 118 \times (764+1,864)</td>
</tr>
<tr>
<td>Study Space</td>
<td>410</td>
<td>10.295</td>
<td>23.510</td>
<td>26.700</td>
<td>ASF = \text{Space Factor} \times (variable %age of FTE + variable %age of FTEF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASF = 35 \times (35% of 1,310 + 5% of 661)</td>
</tr>
<tr>
<td>Study Service</td>
<td>455</td>
<td>1.168</td>
<td>2.321</td>
<td>3.204</td>
<td>ASF = \text{Study Space ASF} \times \text{variable %age}</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASF = 12% of 23,510</td>
</tr>
<tr>
<td>Processing Room</td>
<td>440</td>
<td>2.085</td>
<td>7.498</td>
<td>7.498</td>
<td>ASF = \text{Stack Space(420+430) \times variable %ages}</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASF = 18% of 41,654</td>
</tr>
<tr>
<td>Athletic</td>
<td>520, 523, 525</td>
<td>13.506</td>
<td>50.000</td>
<td>50.000</td>
<td>ASF = \text{Core for FTE up to 3000}</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASF = 60,000</td>
</tr>
<tr>
<td>Media Production</td>
<td>530, 535</td>
<td>4.946</td>
<td>1.810</td>
<td>2.042</td>
<td>ASF = \text{Space Factor} \times \text{Fall FTE}</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASF = 1 \times 1,810</td>
</tr>
<tr>
<td>Demonstration</td>
<td>540, 555</td>
<td>91</td>
<td>181</td>
<td>204</td>
<td>ASF = \text{Space Factor} \times \text{Fall FTE}</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASF = 0.1 \times 1,810</td>
</tr>
<tr>
<td>Animal Quarters</td>
<td>570, 575</td>
<td>66.771</td>
<td>10.860</td>
<td>12.252</td>
<td>ASF = \text{Space Factor} \times \text{Fall FTE}</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ASF = 6 \times 1,810</td>
</tr>
<tr>
<td>Assembly</td>
<td>810, 815</td>
<td>5.678</td>
<td>14.000</td>
<td>14.000</td>
<td>Assembly Space = \text{Core for FTE up to 5,000}</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Assembly Space = 14,000</td>
</tr>
<tr>
<td>Lounge</td>
<td>650, 655</td>
<td>9.907</td>
<td>6.958</td>
<td>8.052</td>
<td>Total Lounge ASF = (Space Factor \times \text{Fall FTE}) + (Space Factor \times \text{Fall FTE})</td>
</tr>
</tbody>
</table>

**Metrics**
## Comparing within the institution

<table>
<thead>
<tr>
<th>Department</th>
<th>Number of faculty</th>
<th>% of total # of faculty</th>
<th>Dept. SF / # of faculty</th>
<th>% +/- average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ocean</td>
<td>9.5</td>
<td>12%</td>
<td>1,943.16</td>
<td>43%</td>
</tr>
<tr>
<td>Civil</td>
<td>12</td>
<td>15%</td>
<td>1,846.92</td>
<td>35%</td>
</tr>
<tr>
<td>Chemical</td>
<td>12</td>
<td>15%</td>
<td>1,446.92</td>
<td>6%</td>
</tr>
<tr>
<td>Industrial</td>
<td>7</td>
<td>9%</td>
<td>1,441.43</td>
<td>5%</td>
</tr>
<tr>
<td>Mechanical</td>
<td>15.5</td>
<td>19%</td>
<td>1,412.32</td>
<td>4%</td>
</tr>
<tr>
<td>Electrical</td>
<td>25</td>
<td>31%</td>
<td>818.16</td>
<td>-40%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>81</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td></td>
<td><strong>1,363.22</strong></td>
<td></td>
</tr>
</tbody>
</table>
Some other things to check

- Centrally- vs. departmentally-scheduled classrooms
- Space “loans” across organizational boundaries
- Institutional memory of loans and allocation promises
- Space devoted to highly specialized equipment
- Amount of highly specialized space (e.g. clean rooms)
- Quality of fit of program to space. For example:
Does the Lab Building Fit the Program Goal?

- **Balance of Lab Space**
  - Individual PI's
  - Core Labs

- **Lab Allocation & Control**
  - Department
  - Central

- **Lab Configuration**
  - Hard Wall
  - Open

- **Mix of Lab Types**
  - Computation
  - In Vivo

- **Capacity for MEP Upgrades**
  - Constrained
  - Expansion Possible

Metrics
Nor do all offices have the same rules:

- Assignment vs. occupancy vs. utilization
- 2nd (or 3rd) offices
- Emeriti
- Nobel Prize winners
Realistic supply and demand

- Available space = inventory x utilization rate
- Defined need vs. programming formulae
- Jurisdictional envelopes
- Demand prioritization on the way up
- Annual capital budget cycles
- Space demand forecast process
Space audits

- Audit Types
  - Inventory accuracy (partitions, room type)
  - Occupying department (self-reported?)
  - Basic utilization
  - Appropriate use
  - Condition

- Audit frequency
- Audit photos
- Efficient data handling techniques
- Track audit GSF / day
Quick utilization audits

- Use on targeted subset of rooms
- Goal: $\leq 30$ seconds per room
- Identifies underutilization ranges
- Criteria of interest to both planners and federal auditors
- Basis for further investigation, not an indictment (many justifiable cases)
- Compare to sponsored research cost recovery room lists

<table>
<thead>
<tr>
<th>Code</th>
<th>Utilization Audit Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>O</td>
<td>Fully occupied</td>
</tr>
<tr>
<td>V</td>
<td>Vacant</td>
</tr>
<tr>
<td>P</td>
<td>Limited personnel in rooms</td>
</tr>
<tr>
<td>E</td>
<td>Limited equipment present and/or functioning</td>
</tr>
<tr>
<td>S</td>
<td>Significant space taken up by packing cases or other storage material</td>
</tr>
<tr>
<td>U</td>
<td>Use discrepancy (e.g. lab used as office)</td>
</tr>
<tr>
<td>I</td>
<td>Inappropriate materials (ping pong tables, couches in labs, arcade games)</td>
</tr>
<tr>
<td>D</td>
<td>Considerable disarray, trash on floor or work surfaces, heavy dust</td>
</tr>
</tbody>
</table>
Using space audit photos
Research space utilization audits
Who makes space decisions on your campus?

- Space Committee
- Provost
- President
- Dean
- Whoever played golf with the President last
- Nobody
- Anybody
- It depends
Policies protect the institutional prerogative

- **Strategic space policies**
  - Differentiate ownership vs. occupancy
  - Annual space and capital planning
  - Formal space change process
  - Mandated space inventory

- **Tactical management policies**
  - Reallocation of underutilized space
  - Space request and allocation process
  - Control of partition and MEP changes

- **Data integration policies**
  - Mandatory common taxonomy
  - Explicitly assigned responsibility for data sources
  - Business planning for any integration
Some key control points

- Central request and allocation process
- Jurisdictional envelopes
- Departmental space plans
- Single campus source for basic space data
- Continuous utilization monitoring
- Building code compliance process
- Integration with strategic academic planning
Policies and Politics

- Visiting and adjunct professors – unique needs and requirements
- Emeriti and 2\textsuperscript{nd} offices for professors - implement policies to take back the spaces when they are needed
- Again, focus on highest best use
- Suitability and utilization ratings for spaces in question
- Ranks of the occupants of spaces on campus
- Distill job types to a list short enough to use in analysis
- Be aware of contract employee space requirements
- Without political muscle don’t bother trying to make your case.
Policies and politics, cont.

- What is the cycle of review for research space?
- If looking at $ / SF, do you look at one year or an average of multiple years?
- Research expenditures vs. total grant award?
- How soon after funding loss do you think about taking space back?
Articulate the cost of underutilization

- Acquisition or replacement cost vs. better utilization
- Impact on recruitment, retention, and enrollment
- Constraint of program growth or new initiatives
- Analyze and explain current occupancy patterns
- Problematic business cases for new capital projects
- Optimize sponsored research cost recovery while ensuring an audit-ready stance
Numbers that get attention

\(<n> \text{Underutilized ASF } \times 1.5 \times \text{<construction cost rate>}\)

- For a 5,000,000 GSF Campus:
  - Lab & Office space \(\approx 1,250,000\) GSF (about \(\frac{1}{4}\) of campus)
  - New construction cost = $800 / GSF
    (or, $800,000 per 1,000 GSF)
  - 1% underutilized lab & office space = 12,500 GSF
  - New construction cost: 12,500 \(\times\) $800 = $10,000,000

Selling the Results
Put underutilization in perspective

Factors In Space Needs Forecasting

- Perceived Space Demand In Excess of Inventory (50-250K ASF)
- New Bio-Tech Bldg (100-150K sf)
- Hypothetical New Building
- Potential Underutilization 58,270 ASF 87,405 GSF
- Research Revenue
- SPACE AUDIT BY ONR
- ONR AUDITORS IN RESIDENCE
- Campus Space Inventory (At present, 3.3M GSF)

Selling the Results
"Data and reporting don’t change business practice and process. Policy does.”
The basis for change

- A real need for institutional leadership
- Articulation of current situation
- Interpreted analyses supported by trusted data
- Acknowledgement of common problems
- Differentiation of “ownership” and occupancy
- Shared problems require shared solutions
"Our space utilization study revealed that you have two square feet more than is allotted, so we're going to keep the office recycling bin in here."
Some Take-Aways

- Develop defendable, compelling data
- Steal data from anyone
- Always question benchmarked data
- Walk your space
- Beware of self reported data
- [http://www.scup.org/resources/topic_issue/managing-space.html](http://www.scup.org/resources/topic_issue/managing-space.html)