

GBBN

University of Pittsburgh | Library System

OBSERVATION BASED METHODS

Hillman Library Post Occupancy Evaluation & Furniture Usability Assessment

We live in a data-dominated world

Data is shaping how people make everyday decisions.
What insights data can talk about architectural spaces?



Heart rate
Track cardiovascular health

Activity
Monitor movement and exercise

Sleep
Understand sleep patterns

Calories
Estimate energy expenditure

Stress
Measure stress and recovery

Real-time data
Continuous and objective measurement

Personalized insights
Identify patterns and trends

Better decisions
Support healthier lifestyle choices

Imagine a tool...

that collect data and analyze the space occupancy situation efficiently



Time series behavioral data

Data Visualization & Analytics

Evidence-Based Space Decisions

TOP UTILIZATION ROOM

Room G07

Level G · 40.9% avg utilization

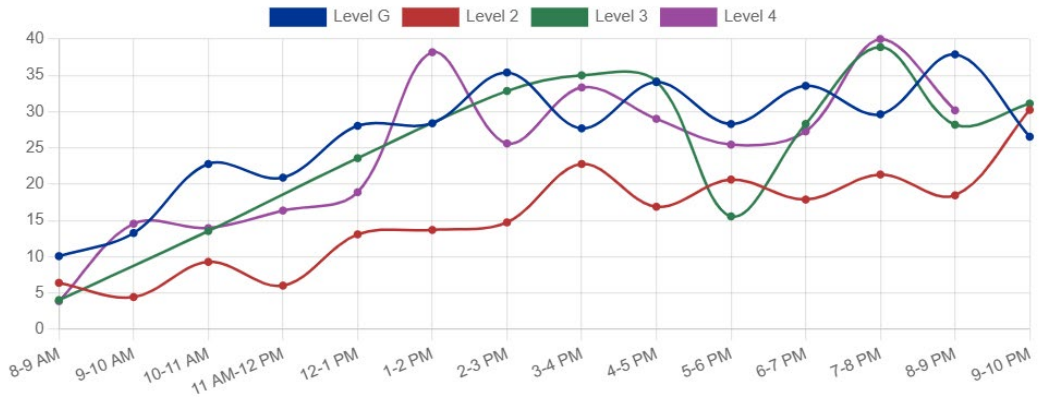
MOST OFTEN EMPTY

Room G08

Level G · 95.6% empty rate

Hourly Utilization By Level

Each line represents one level unless a level is selected above.



OCCUPANCY HEATMAP

	8 AM-10 AM	10 AM-12 PM	12 PM-2 PM	2 PM-4 PM	4 PM-6 PM	6 PM-8 PM	8 PM-10 PM
MON	10.4%	27.5%	35.6%	43.8%	48.7%	47.4%	43.4%
TUE	8.5%	20.9%	33.5%	41.2%	42.7%	42.5%	43.2%
WED	9.1%	26.0%	38.4%	42.9%	46.7%	39.1%	36.6%
THUR	5.3%	23.3%	30.7%	41.3%	35.9%	27.3%	22.3%
FRI	-	15.6%	22.5%	23.5%	21.3%	13.6%	6.6%
SAT	-	12.4%	24.7%	32.8%	29.6%	20.5%	15.3%
SUN	-	11.1%	22.9%	58.1%	59.1%	40.0%	31.0%

Low — High

Sensor-based vs Observational Methods

Observation captures finer seat-level data than sensors, at a fraction of the cost without violating student privacy

SENSOR-BASED METHOD



Motion, thermal sensor, or WIFI-based usage sensor

- **Expensive**
  Hardware, installation and ongoing maintenance
- **Hundreds of units**
  2,000+ seats need a device per seat or zone
- **Precision issues**
  Missed or false detections at the individual seat
- **Privacy risk**
  Continuous tracking may violate student privacy

OBSERVATIONAL POE



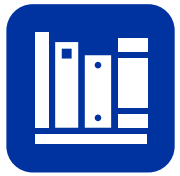
Our method: trained observers on scheduled rounds

- **Low cost**
  No sensor hardware, installation or upkeep
- **Budget friendly**
  Cost scales with observation rounds, not devices
- **Fine granularity**
  Seat-level detail on activity, posture and use

Hillman Library POE

Research Questions:

When do students use the library most?
Where do they choose to sit?
Which group room fills up the most?
Which chair gets used the most?
Which chair gets moved the most?
Who's using the whiteboards?
.....



Librarians' Data Tracking: Analysis of the library data provided by the PITT Library System



Space Occupancy Analysis via Observational Data: Passive observation and behavior mapping to identify students' behavioral patterns.



Furniture Usability Assessment: Occupancy patterns (heatmaps) and frequency of movement.



Data Granularity: Data were analyzed by floors and zones, date and time, furniture type, and user group size.

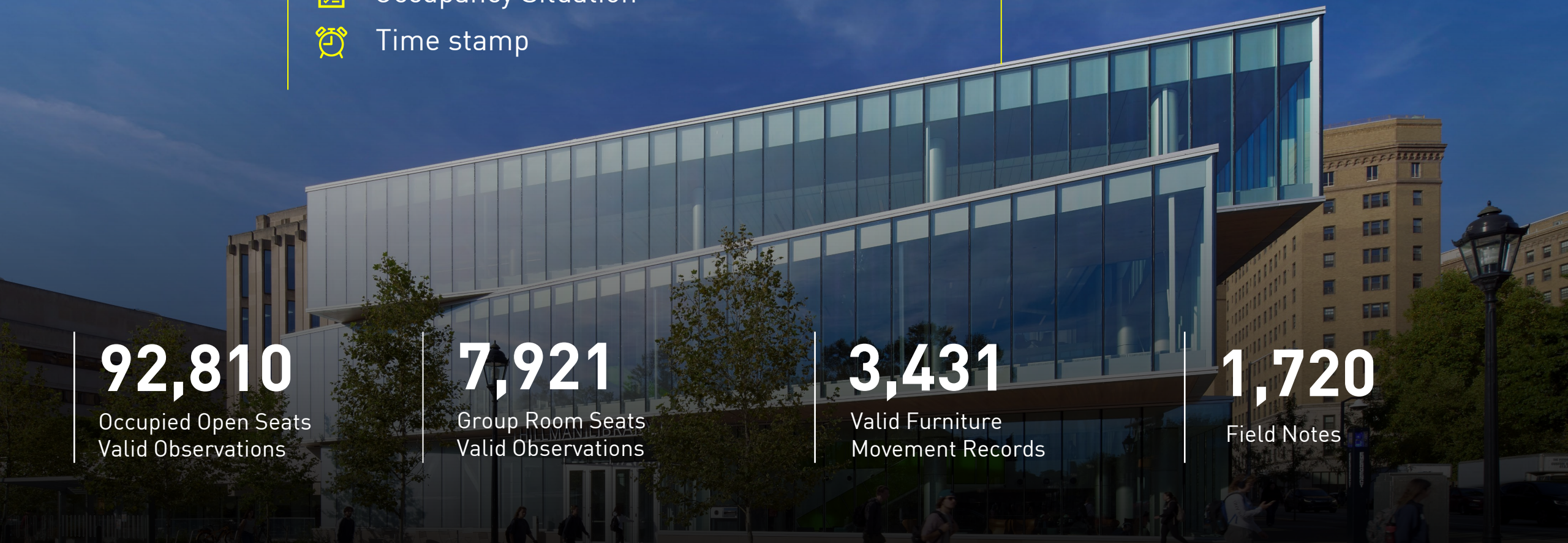
Hillman Library POE Observational Data

100K+
data points

- # Furniture ID
- Furniture Type
- Location
- Occupancy Situation
- Time stamp

300+
hours of data collection

- Data collection from **24** days
- Hours covering 8AM to 10PM
- Weekdays, weekends, event days, and final exam week.



92,810
Occupied Open Seats
Valid Observations

7,921
Group Room Seats
Valid Observations

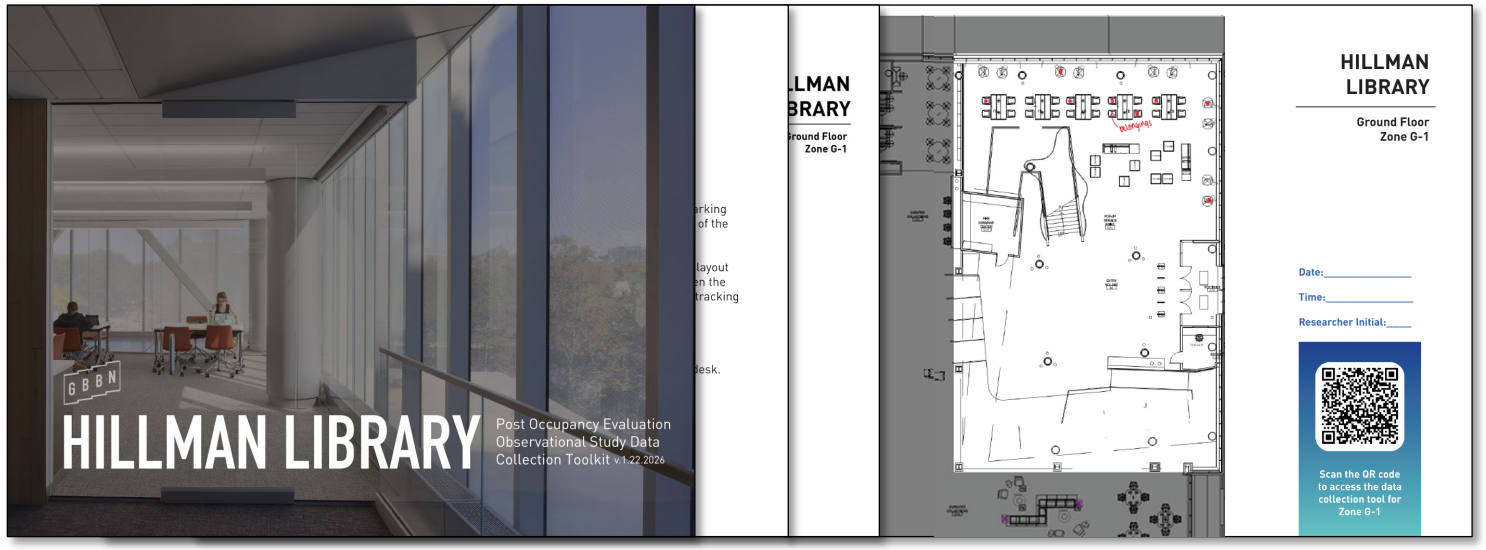
3,431
Valid Furniture
Movement Records

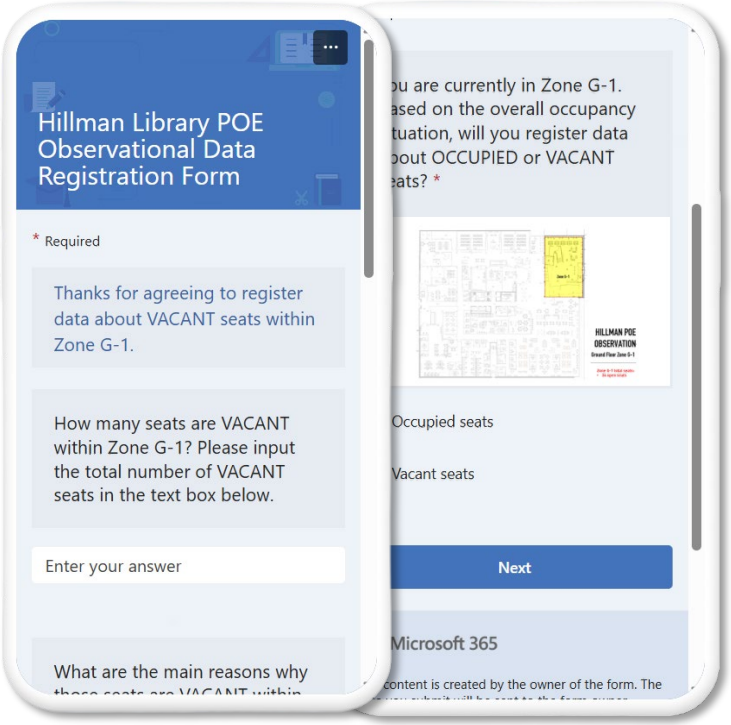
1,720
Field Notes

Hillman Library POE Data Collection Tool

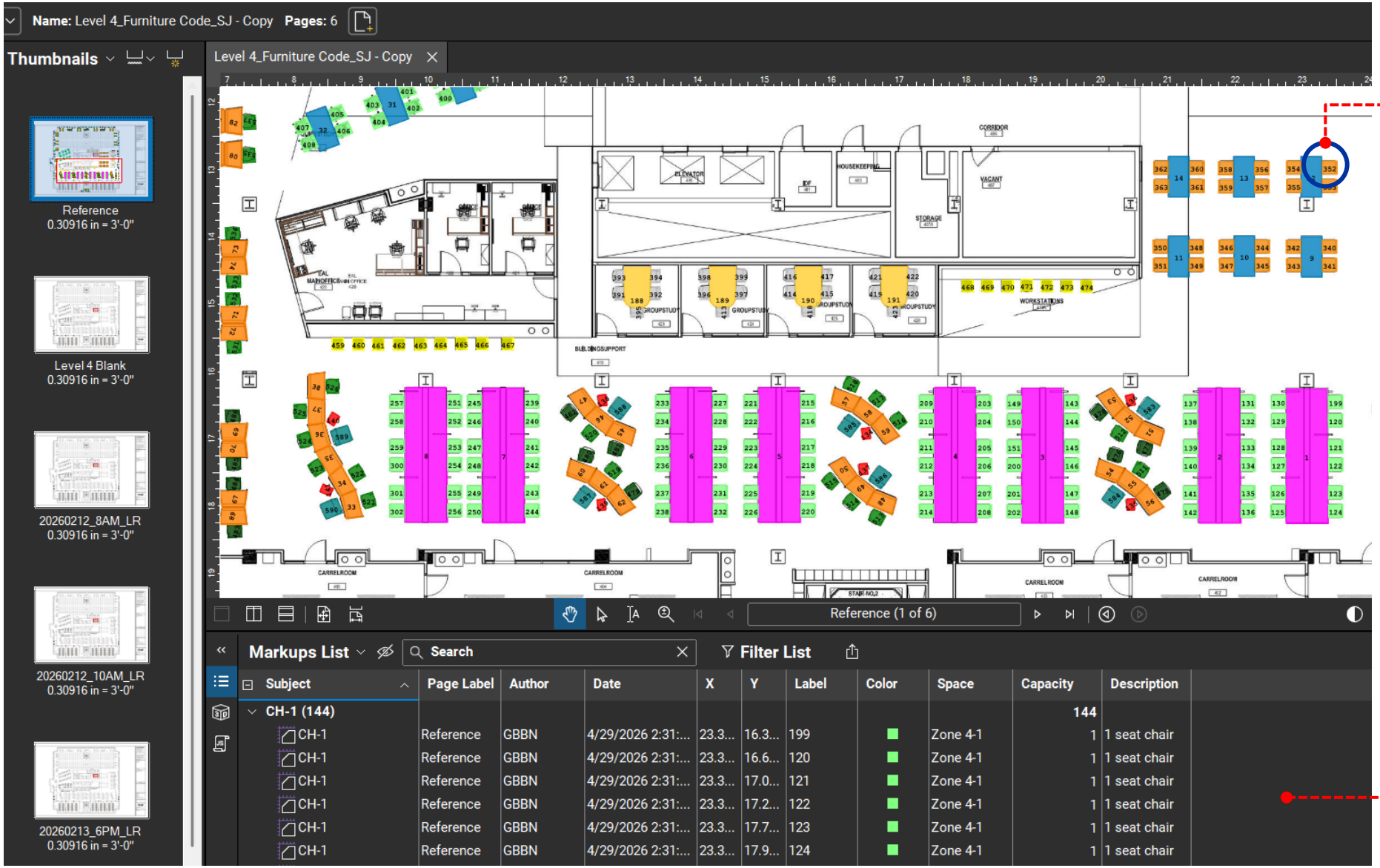
A Self-Developed Data Collection Toolkit Tracking 2,000+ Seats in the Hillman Library

- 1 researcher completed a full zone-by-zone scan of all levels during the assigned 2-hour shift.
- Each completed the online survey documenting seat occupancy conditions within each assigned zone.





Hillman Library POE Data Collection Tool



Each furniture has its own ID and rich information (e.g., location, furniture style, capacity, etc.)

A scalable and extensible database designed to accommodate future data expansion.

Hillman Library POE Timeline

PHASE 01
January 2026

- Research partnership
- Defining scope of work
- Research agreement formalization
- Student researcher recruitment
- Research toolkit development
- Pilot testing and adjustment

PHASE 02
February - May 2026

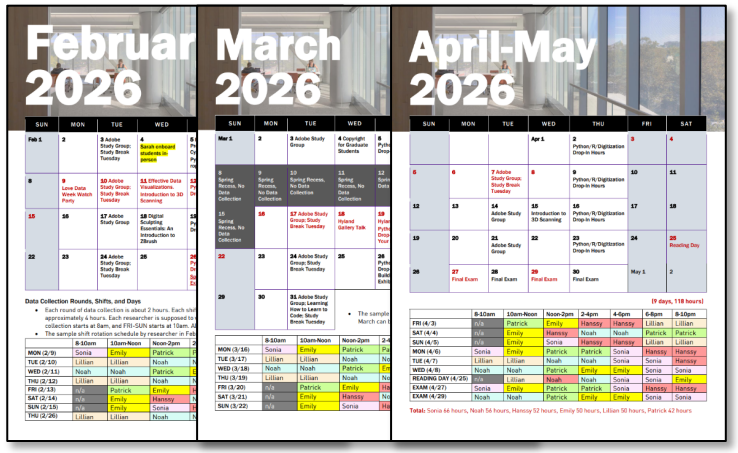
- Student researcher onboarding
- Data collection (totally **316 hours** of observation)
- Data syncing
- Data analytics protocol establishment

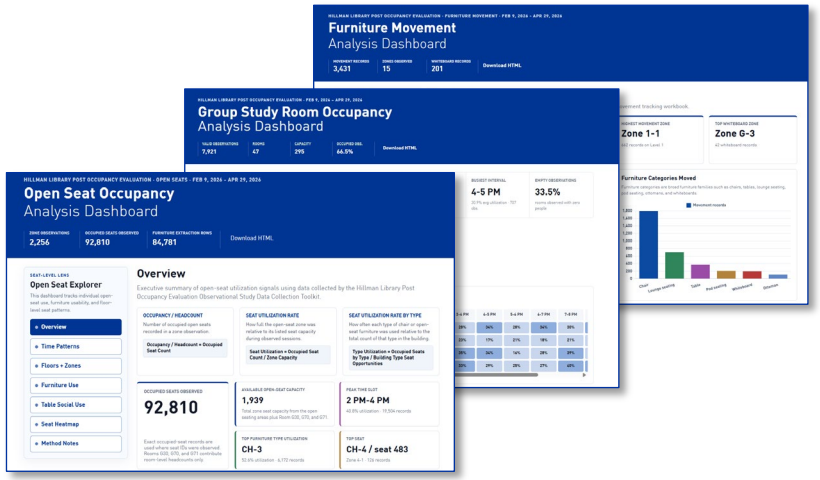
PHASE 03
June – September 2026

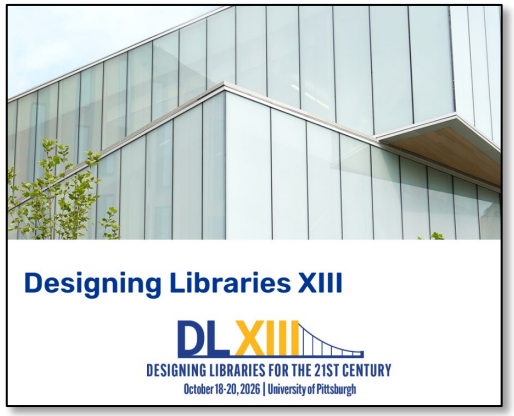
- Data cleaning
- Data analysis dashboard
- Report out
- Preparation for Designing Libraries Conference

PHASE 04
October - December 2026

- Research Dissemination and Report Out
- Conference Presentation
- Research Paper
- Award and Recognition

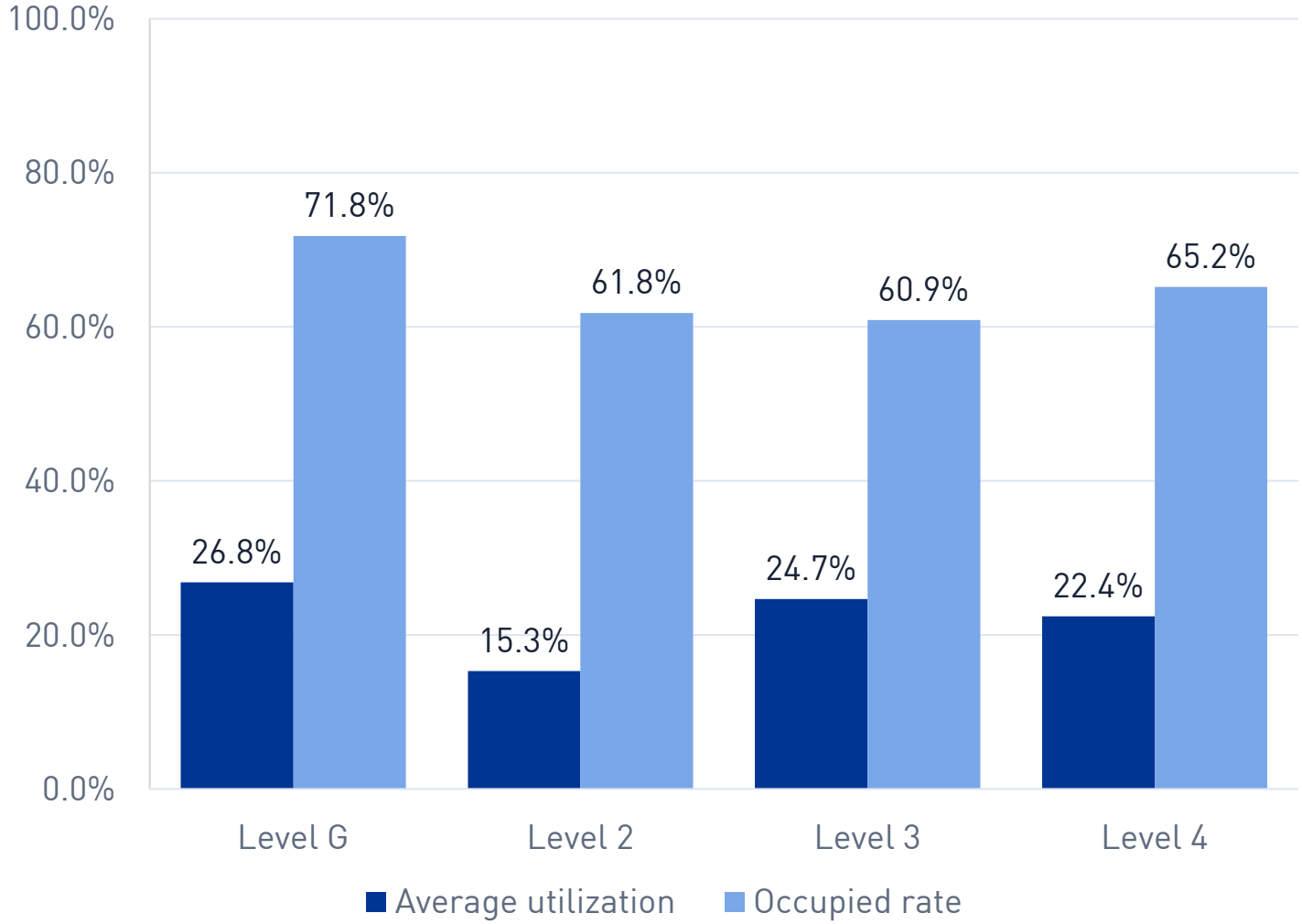






Rooms were occupied often but lightly filled

Overall occupancy and utilization by floor



Level G led average utilization at 26.8% and had the highest occupied rate at 71.8%.

66.4%
of observations included at least one person

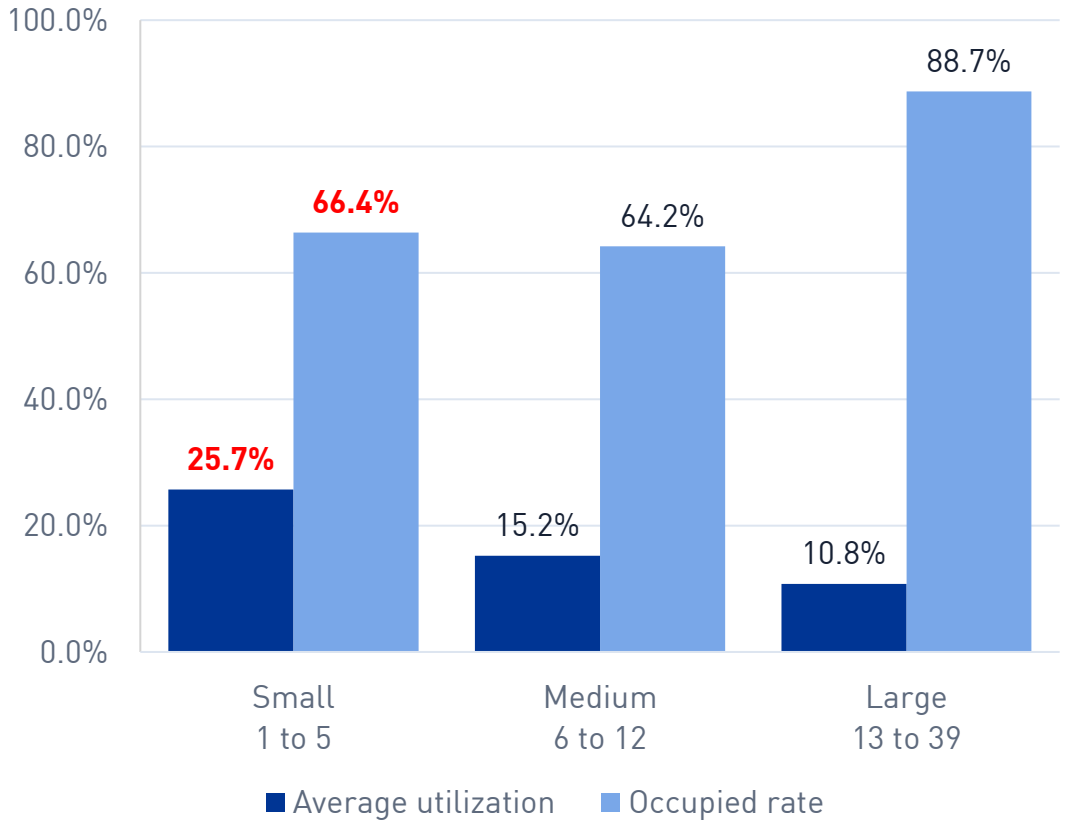
23.9%
average share of room capacity in use

1.32
people per room observation

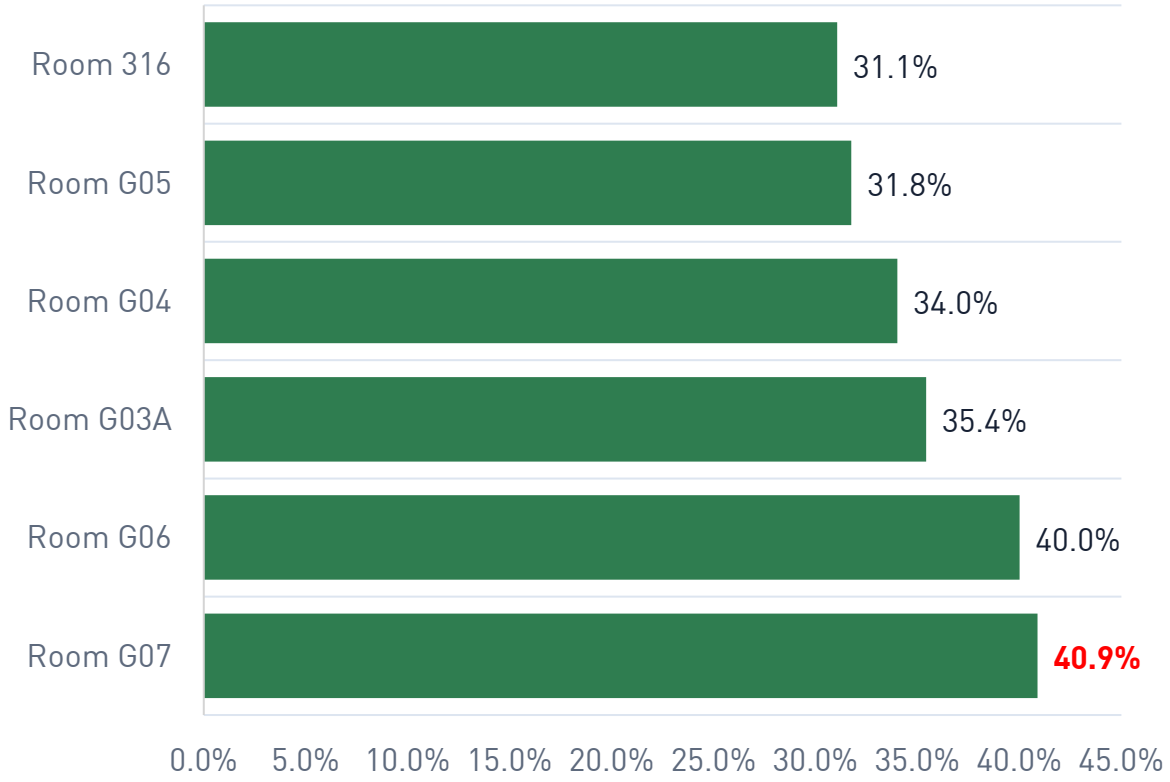
Small rooms filled more efficiently

Room size and the highest-utilization rooms

Performance by room capacity



Highest average utilization

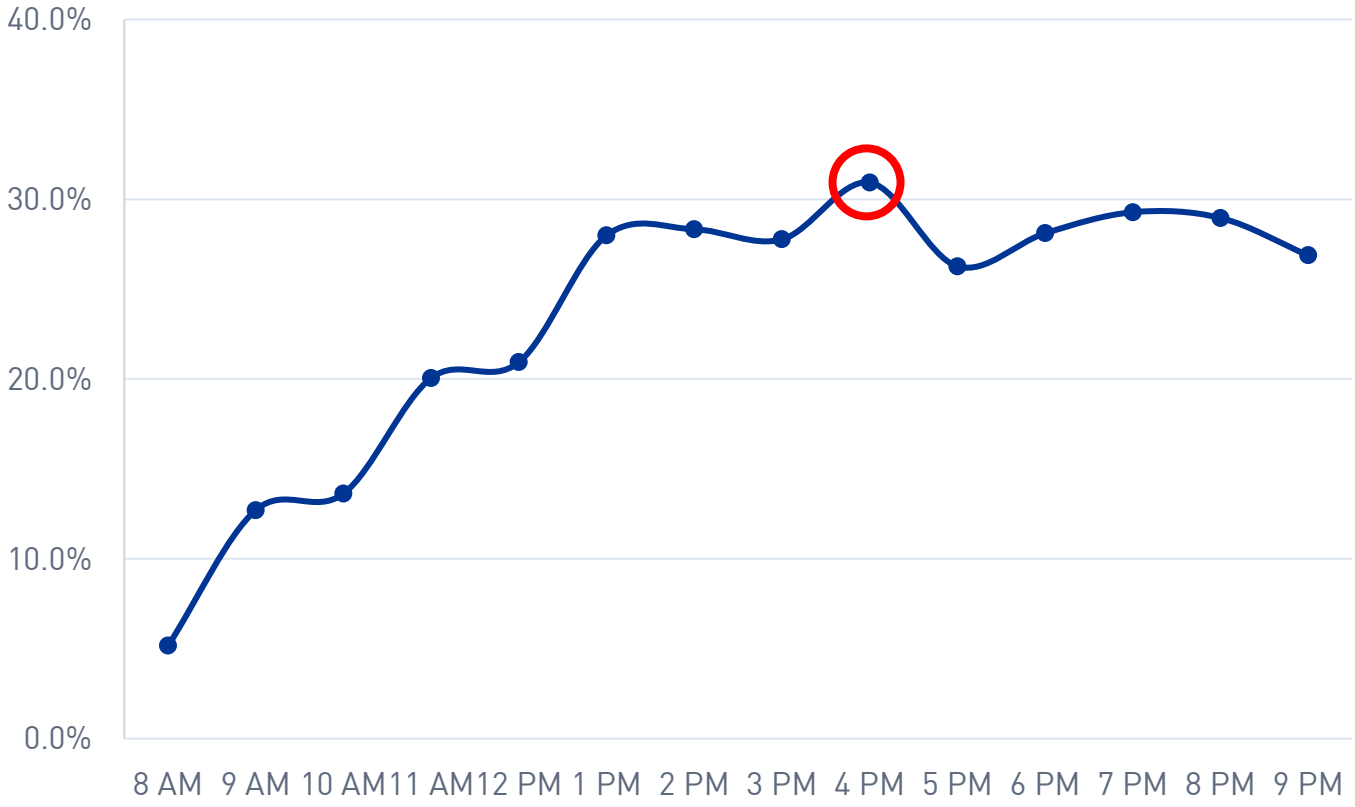


Small rooms averaged 25.7% utilization. Five of the six highest-utilization rooms were on Level G.

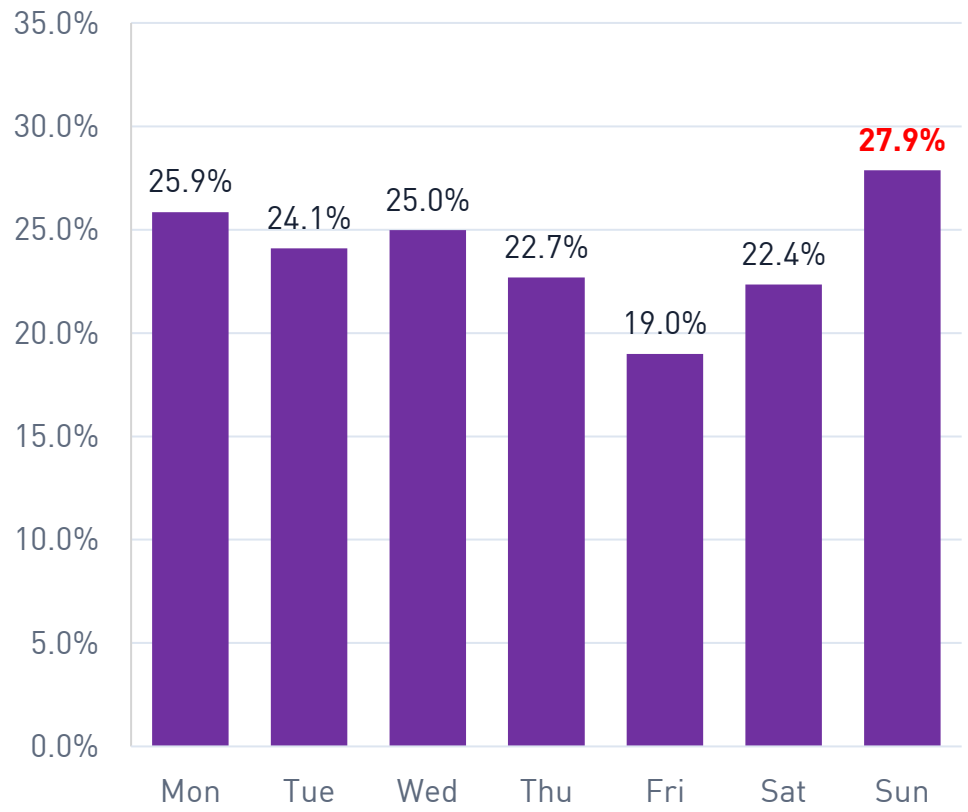
Use peaks near 4PM

Hourly and day-of-week patterns across all observed rooms

Average utilization by hour



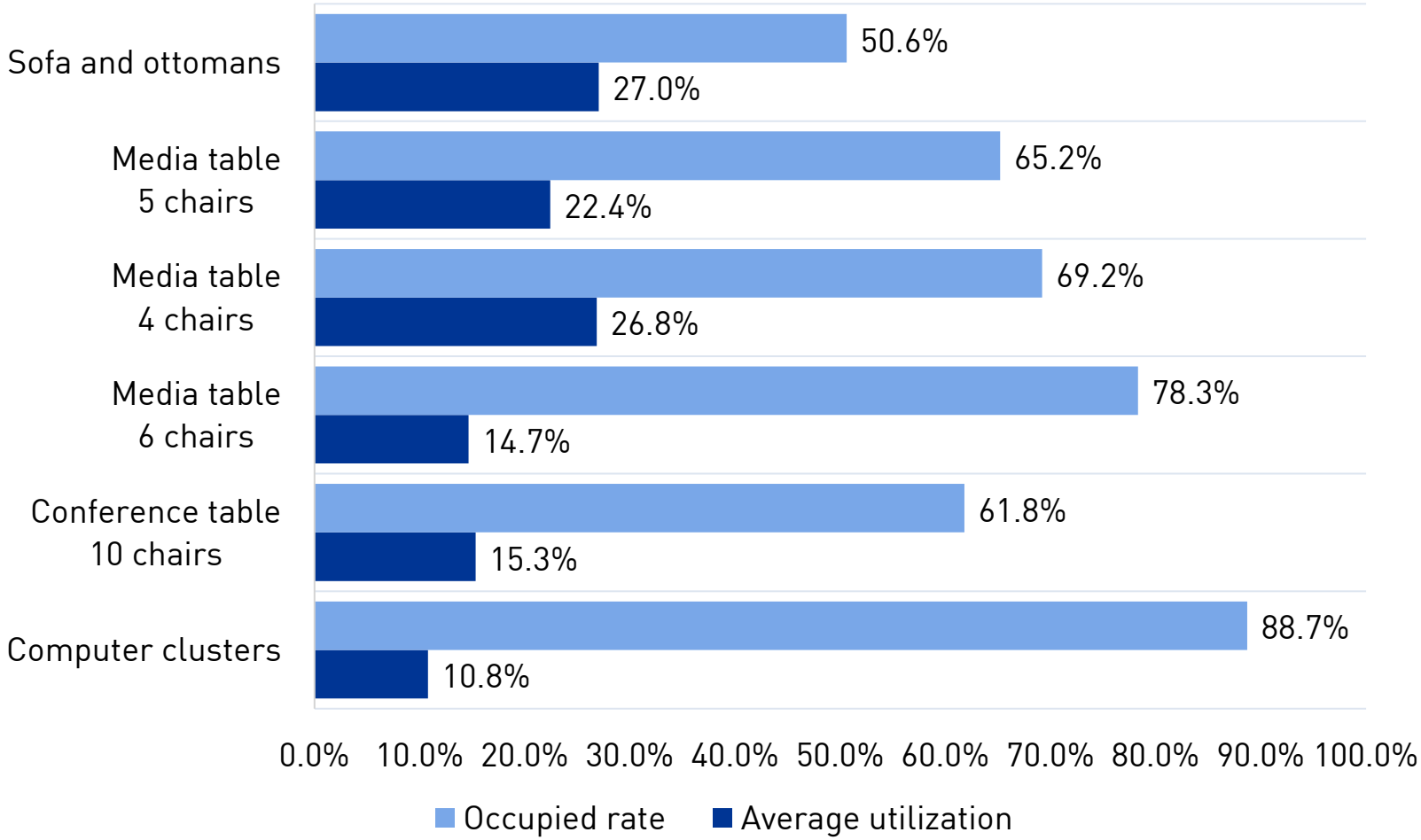
Average utilization by day



Peak hour: 4 PM at 30.9% utilization. Peak day: Sunday at 27.9%.

Four-chair media rooms outperforms

Furniture package performance

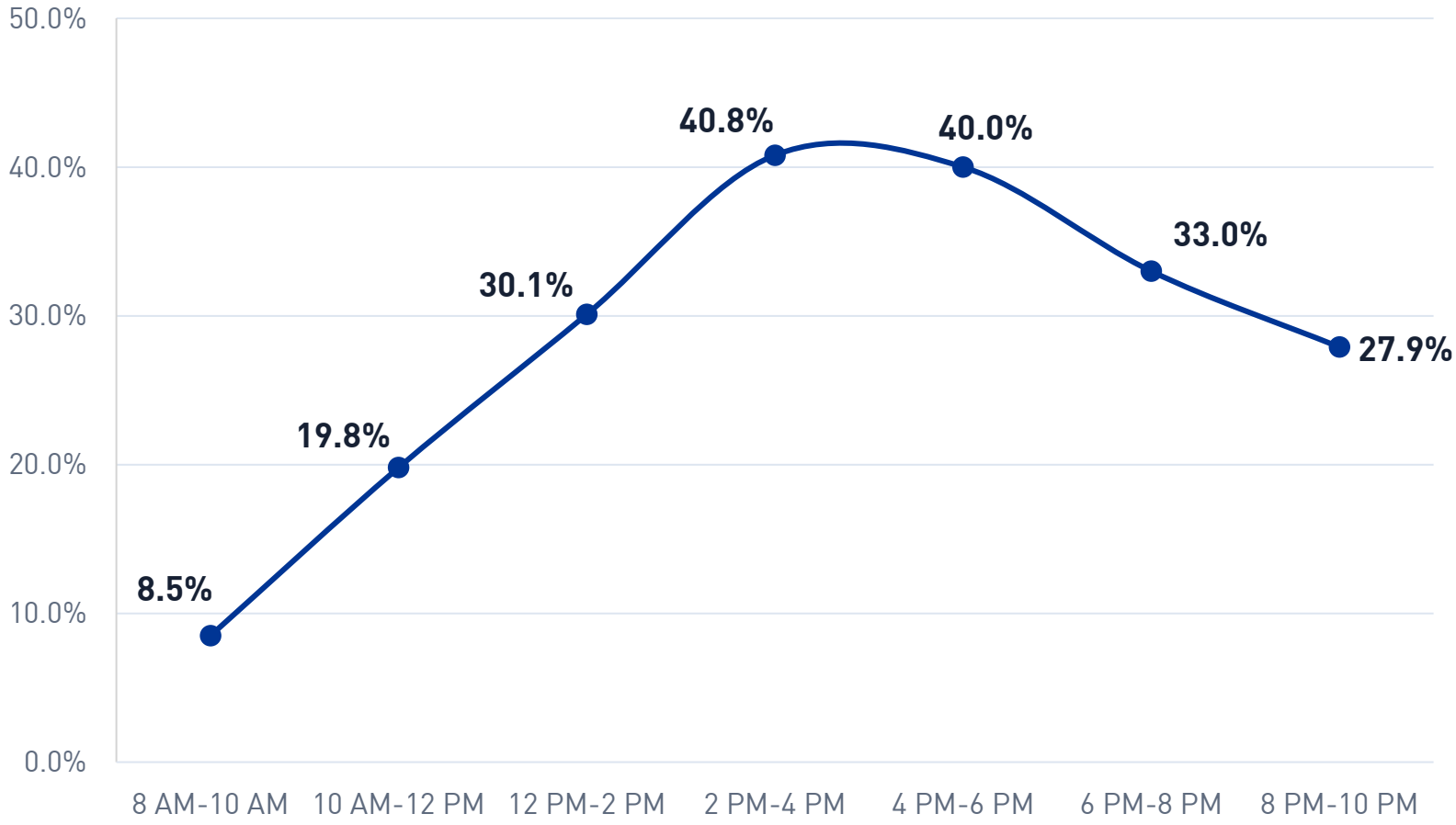


Media table with 4 chairs is overall the highest utilized room

26.8% average utilization
69.2% occupied rate
24 rooms in the dataset

Open-seat use peaked from 2 PM to 6 PM

Two-hour observation intervals across all floors



40.8%

2 PM to 4 PM

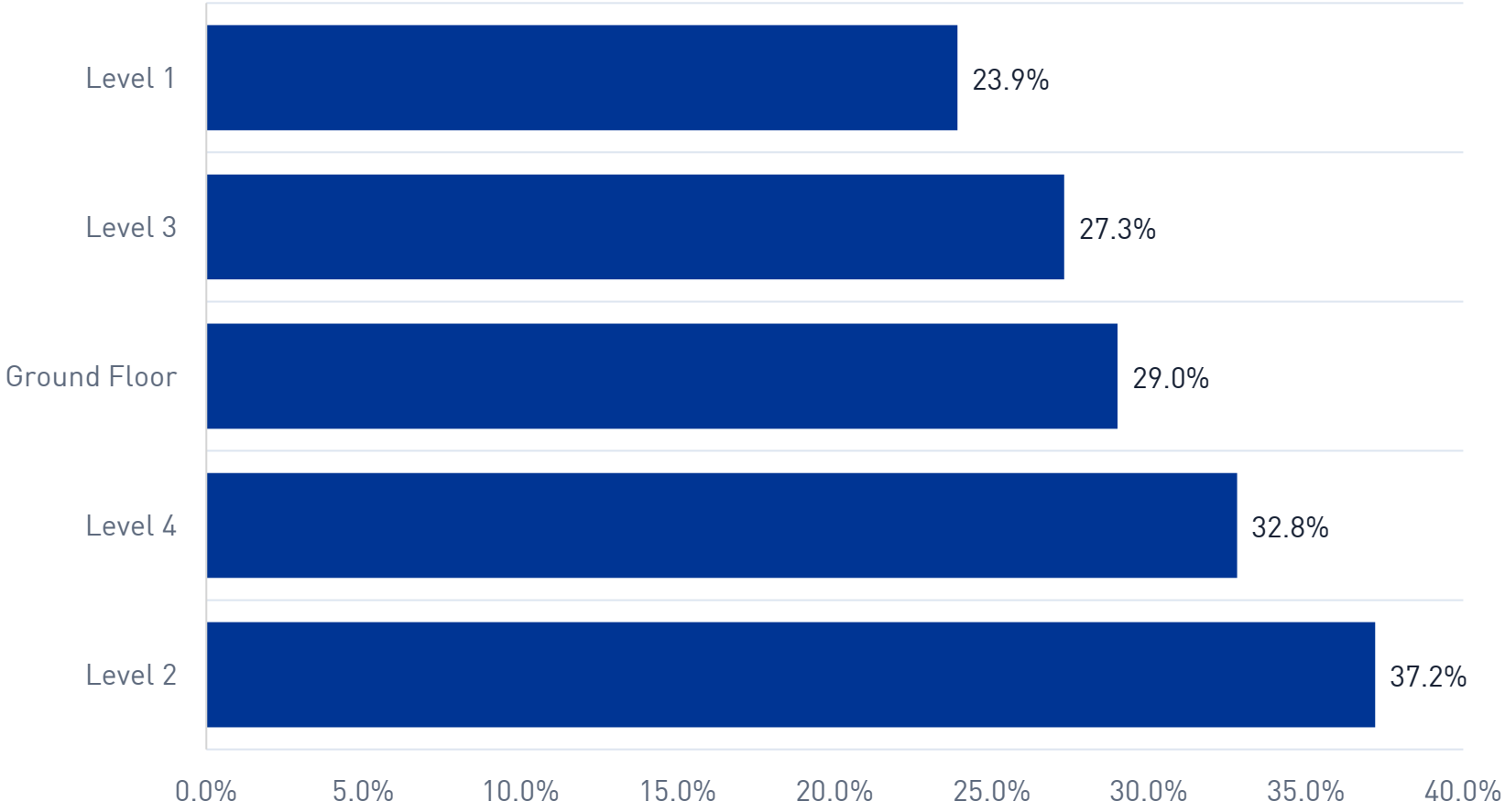
40.0%

4 PM to 6 PM

Usage fell after 6 PM but remained above the morning level through closing.

Level 2 had the highest open-seat utilization

Occupied-seat records divided by observed seat opportunities



37.2%

Level 2 utilization

32.8%

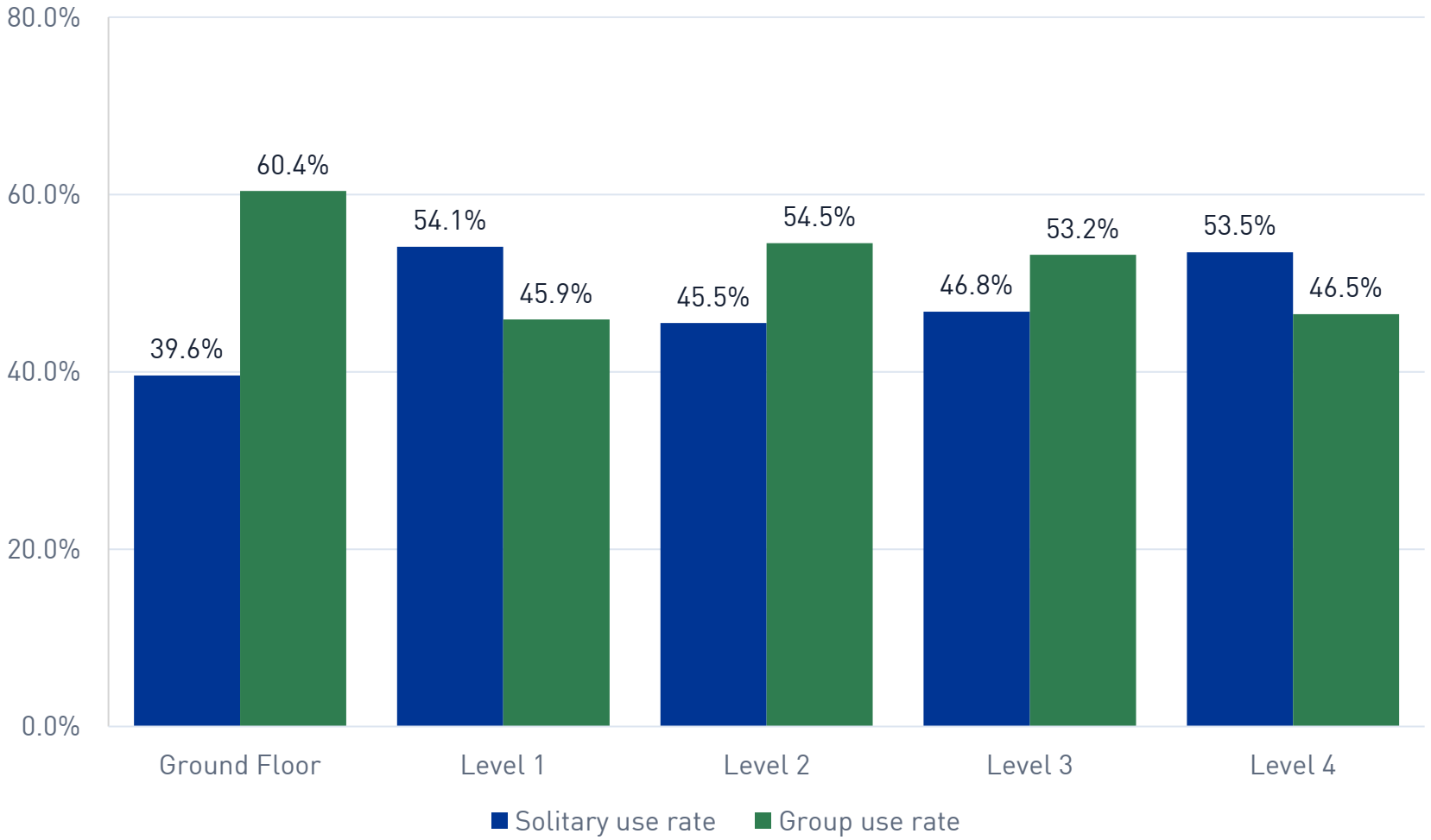
Level 4 utilization

23.9%

Level 1 utilization

Table use differed by floor

Share of occupied TA table sessions used by one person or by groups



60.4%

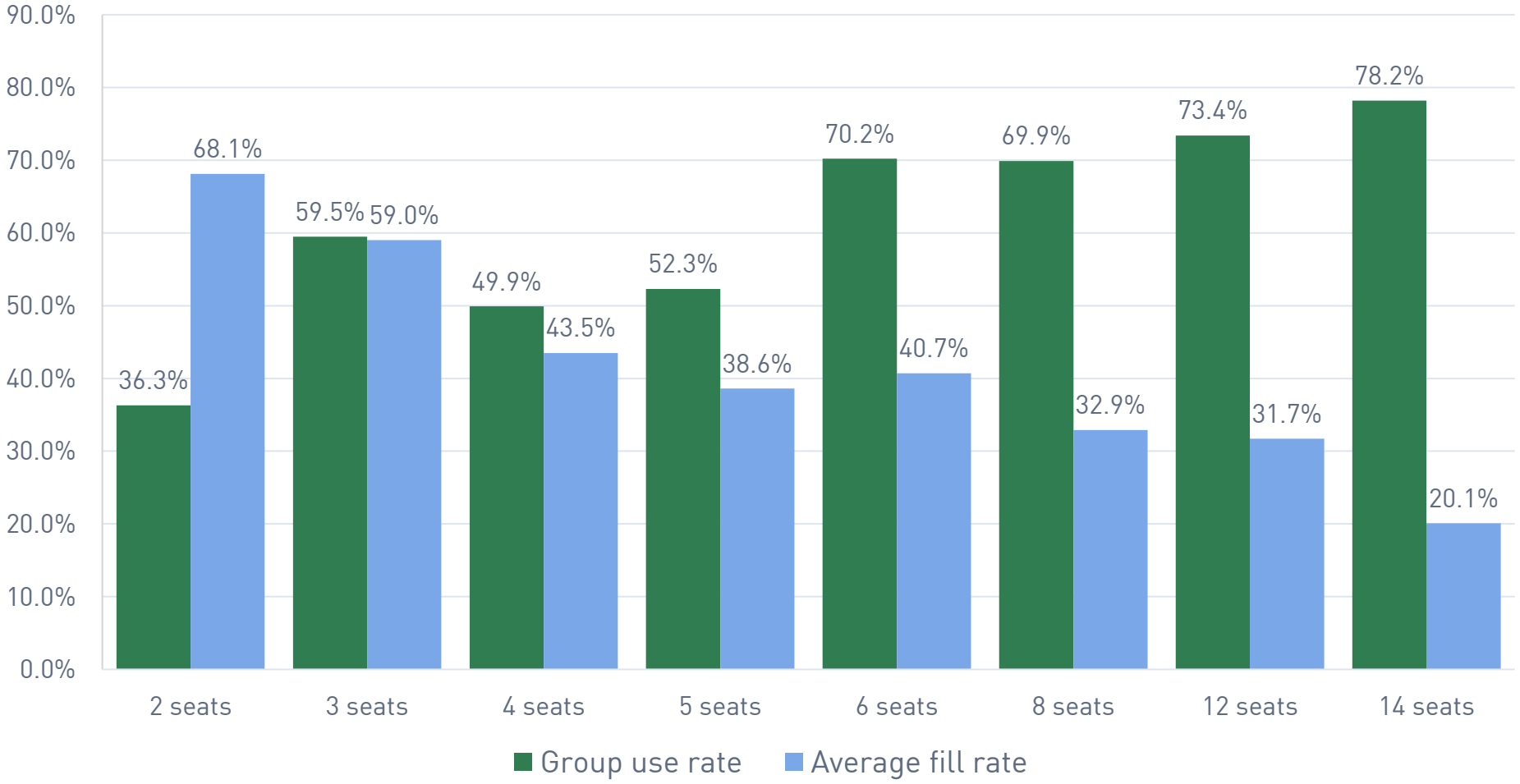
group use on the Ground Floor

54.1%

solitary use on Level 1

Table capacity shaped both behavior and seat efficiency

Group-use rate and average fill rate by mapped table capacity



Two-seat tables

63.7% solitary use
68.1% average fill

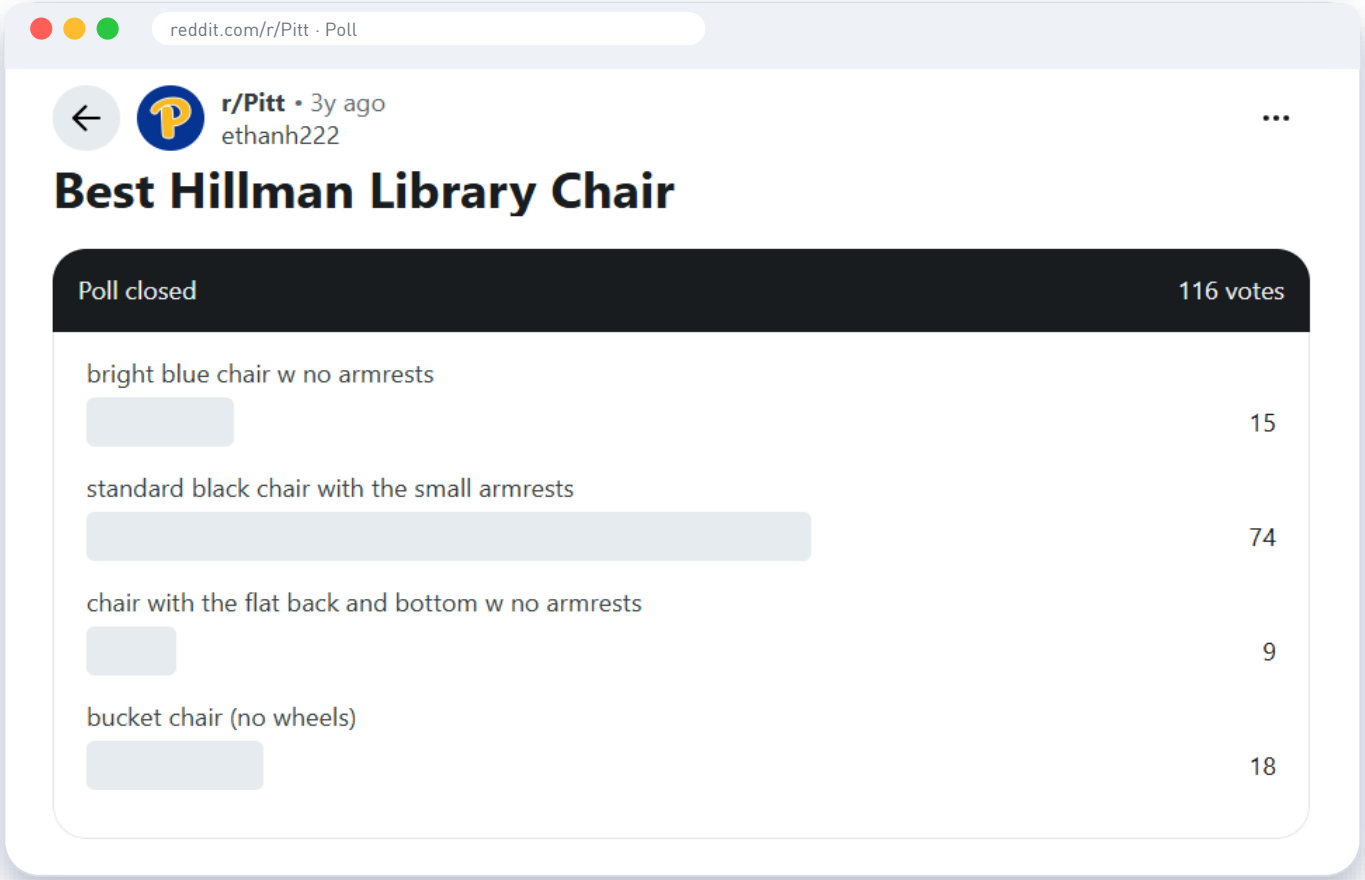
Six- and eight-seat tables

About 70% group use
33% to 41% average fill

Large tables supported groups but often left much of their capacity unused.

Several seat types outperformed the building average

Located along the building edge, abundant views to the outside, and adequate privacy, could be the reasons led to high utilization rate for the bucket chair



#1 Observations CH-1



28.9%
Utilization

16,466
Occupied observations

Standard black chair with small armrests

#1 Utilization CH-3



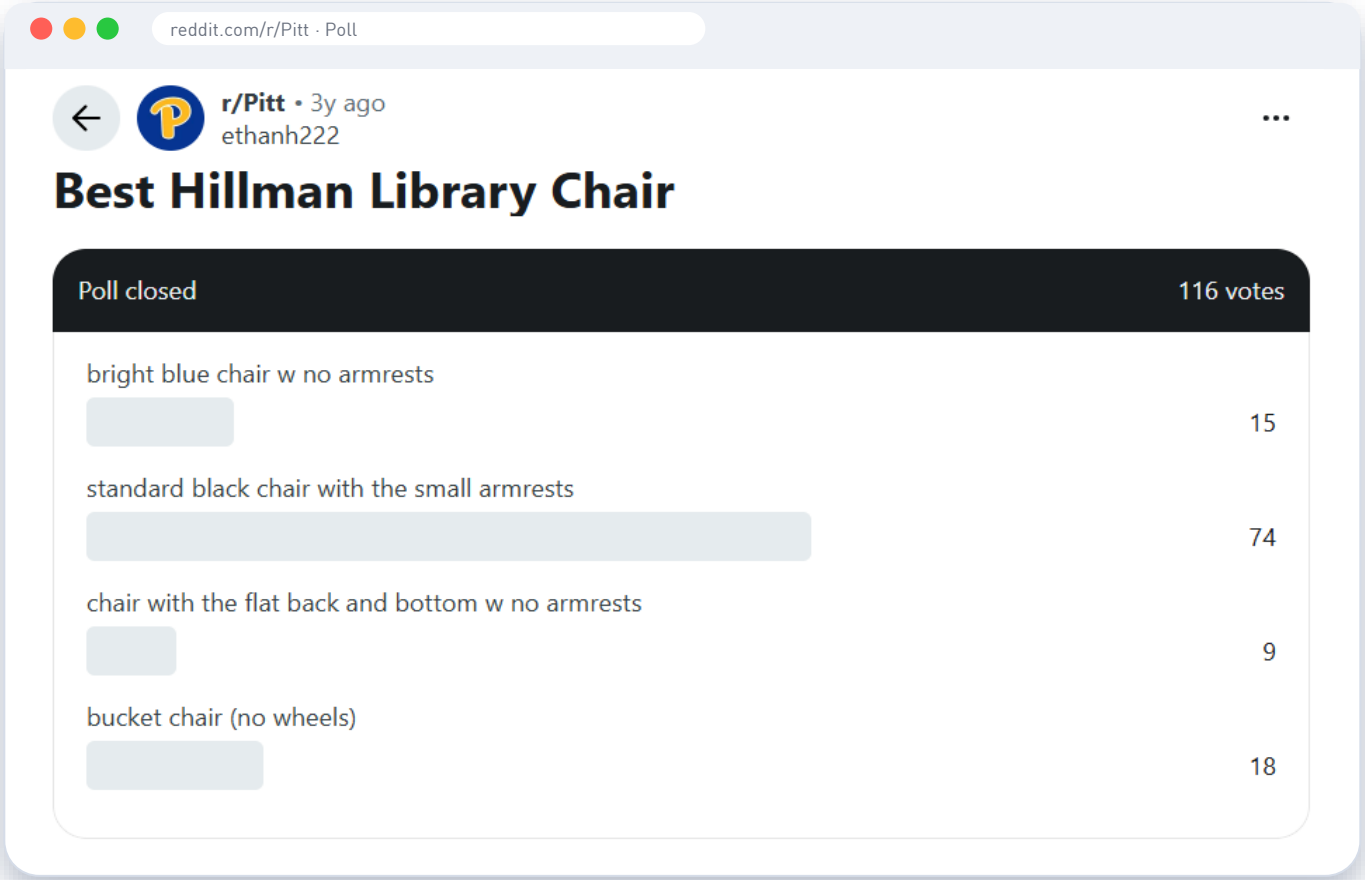
52.6%
Utilization

6,172
Occupied observations

Bucket chair (no wheels)

Several seat types outperformed the building average

Located along the building edge, abundant views to the outside, and adequate privacy, could be the reasons led to high utilization rate for the bucket chair



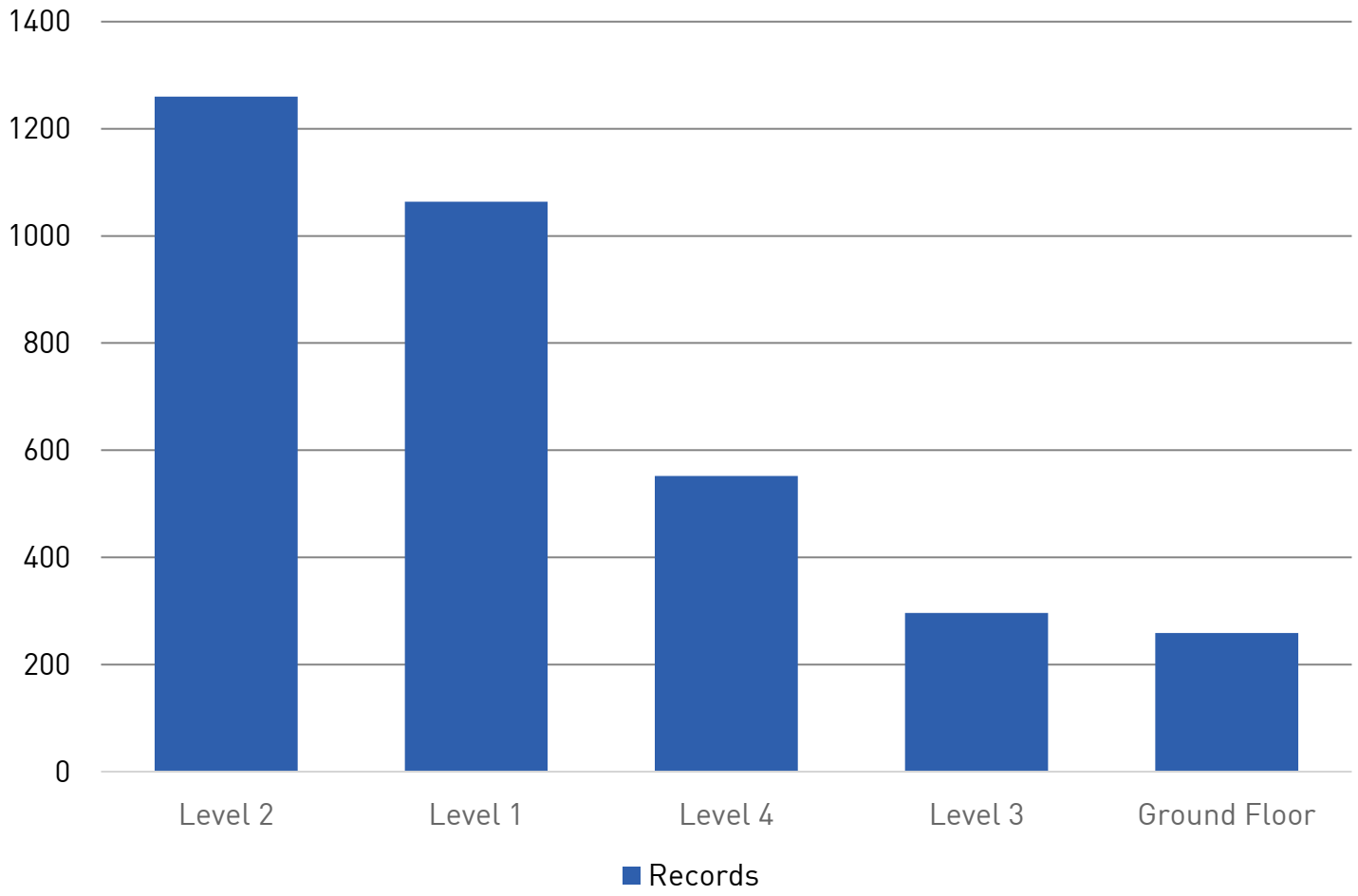


Bucket chairs (no wheels)

52.6% utilization

6,172 occupied-seat records

Furniture movement clustered on Levels 1 and 2
Most movement stayed nearby



61.7%

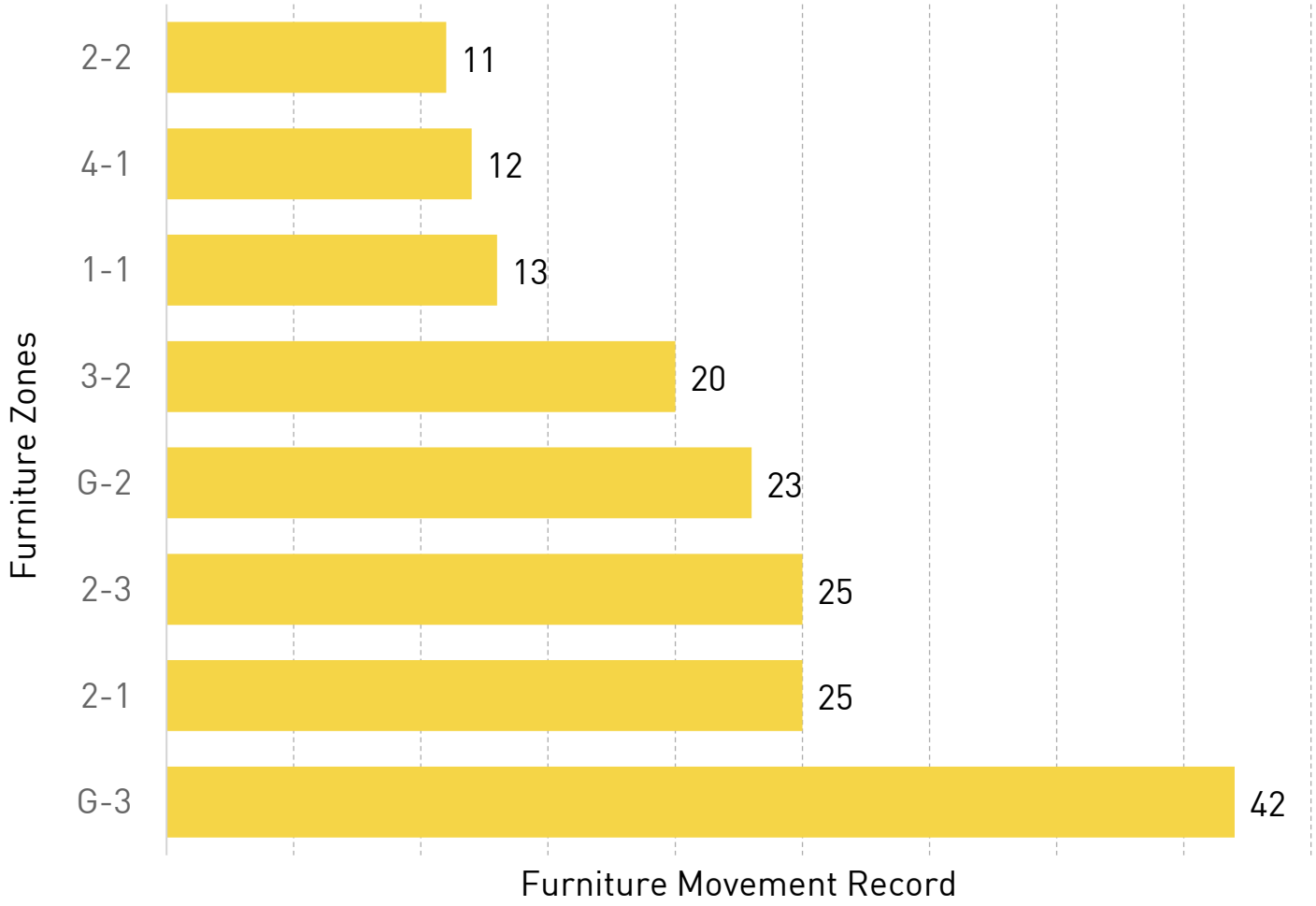
of all records were local moves

Operational indication

Frequent small adjustments create a recurring need to reset furniture within its original setting.

Whiteboard activity concentrated in G-3 and Level 2 zones

Zone G-3 led with 42 records across eight observation dates



201

Whiteboard records

83

Records on Feb 10

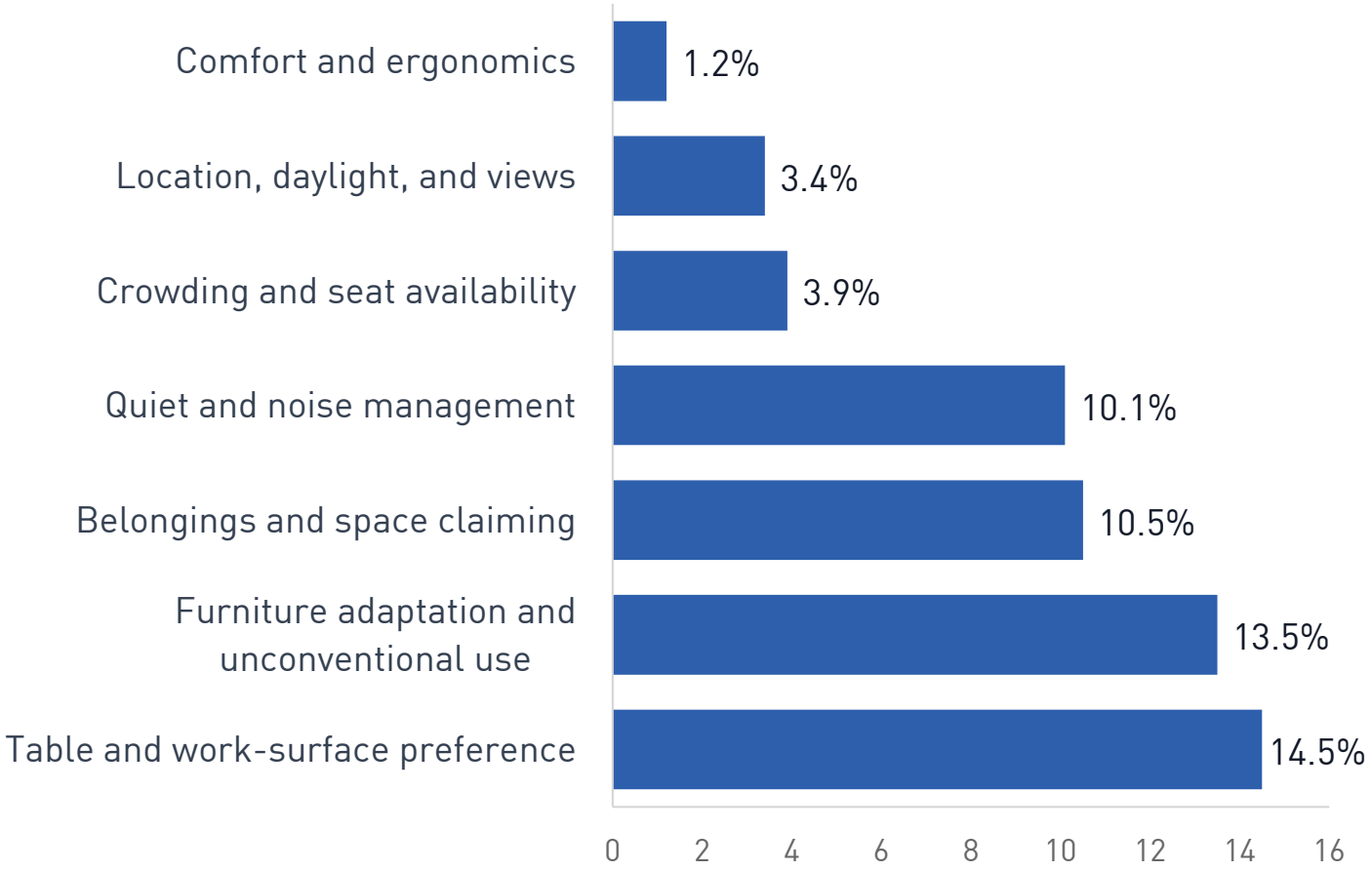
42

Records on Feb 14

The two peak dates account for 62.2% of whiteboard records. Review collection context before treating the spike as a recurring demand pattern.

Library rooms support study, collaboration, and everyday routines

Observer-entered notes



Representative observation note

"Doing work and socializing"

Furniture adaptation

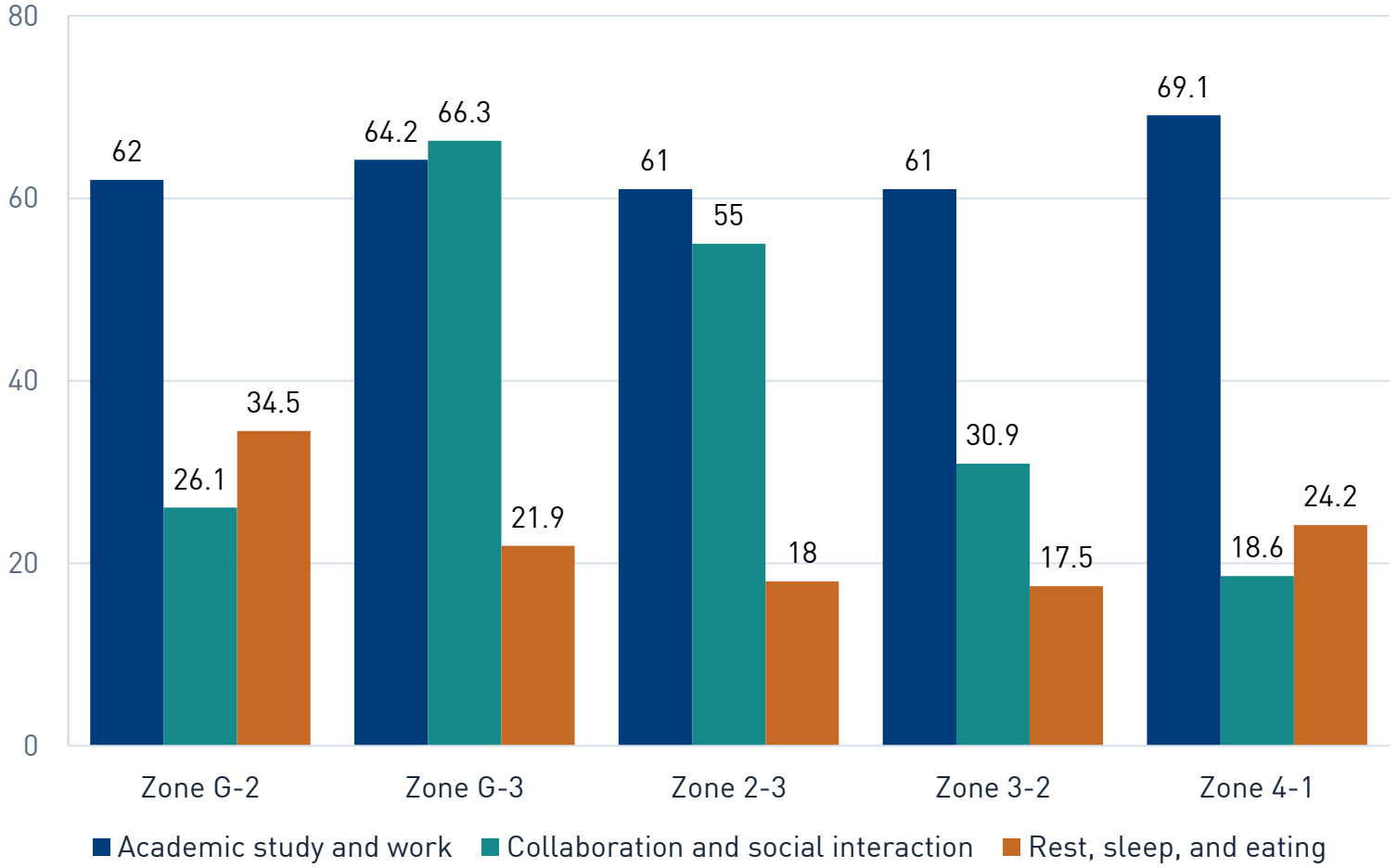
"Students grabbed new chairs to sit on the side of the table"

Space claiming

"A few instances of belongings on tables or chairs with no owner"

Theme patterns differ across observation zones

Each percentage uses the analyzed note responses from that zone as its denominator



Zone G-3

Collaboration appears in 66.3% of analyzed notes, slightly above academic study at 64.2%.

Zone G-2

Rest, sleep, or eating appears in 34.5% of analyzed notes, the highest share among the five zones.

Zone 4-1

Academic study appears most strongly here at 69.1%.

Key Takeaways

Takeaway #1
Right Sized Rooms

Prioritize compact individual settings and four-seat group rooms. Reserve larger rooms for defined needs and layouts that can be subdivided.

Takeaway #2
Staffing and Maintenance

Target investment, staffing, cleaning, and furniture resets by floor and zone.

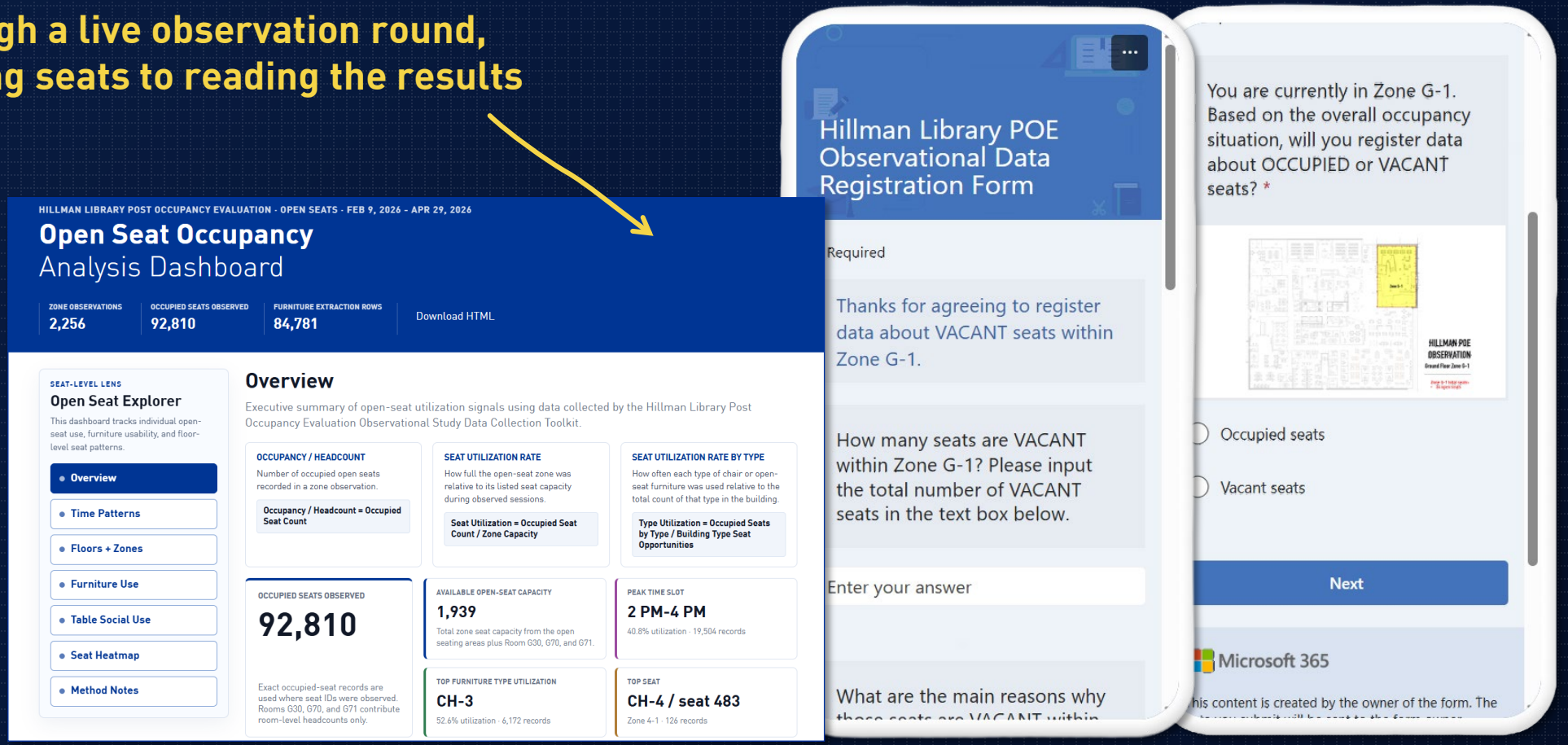
Takeaway #3
Furniture Wear & Tear

Use durable furniture that is easy to move and reset, particularly at high movement record levels.

Provide convenient power, writable surfaces, and media support where demand is demonstrated, and plan repair priorities through condition audits.

Interactive Session: Get hands-on with the observational tool

Work through a live observation round, from recording seats to reading the results



WE'RE PRESENTING AT DESIGNING LIBRARIES XIII

Pre-Conference | Oct 18th | 1–5 p.m.
University of Pittsburgh, Hillman Library

Post-Occupancy Evaluation: Did Our Library Space Actually Work?



SHAN JIANG
PH.D.
sjiang@gbbn.com



MATTHEW PLECITY
AIA, ASLA
mplecity@gbbn.com



Scan the QR code to test the tool!

Observation-Based Methods: Session Summary

Hillman Library Post-Occupancy Evaluation and Furniture Usability Assessment | Participant handout

How the method works

316 hrs
of observation

24 days
incl. finals week

2,000+
seats tracked

14 hrs/day
8 AM to 10 PM

- Observers scan every zone in 2-hour shifts and log seats in an online form
- Each furniture item has an ID with its location, style and capacity
- **Versus sensors:** lower cost, seat-level detail, and no continuous tracking of students

What we found

- **Rooms were busy but lightly filled:** 66.4% of observations had someone in the room, yet only 23.9% of capacity was in use
- **Small rooms filled best:** 25.7% utilization; four-chair media rooms led at 26.8%
- **Use peaked at 4 PM and on Sundays:** 30.9% and 27.9% room utilization
- **Large tables sat half-empty:** two-seat tables averaged 68.1% fill vs 33–41% for six- and eight-seat tables
- **Bucket chairs were most used:** 52.6% utilization, likely due to edge location, views and privacy
- **Furniture moves stayed local:** 61.7% of moves were small adjustments nearby

Design takeaways

1 Right-size rooms

Prioritize compact individual settings and four-seat group rooms; reserve large rooms for defined needs or layouts that can be subdivided

2 Target staffing and upkeep

Plan investment, staffing, cleaning and furniture resets by floor and zone

3 Plan for wear and tear

Choose durable furniture that is easy to reset; add power, writable surfaces and media support where demand shows; set repair priorities through condition audits

Timeline **Jan 2026** toolkit and pilot → **Feb–May** data collection → **Jun–Sep** analysis and dashboard → **Oct–Dec** conference, paper