

# Plasmas, Pizzas, Socializing, and Silence: Creating Library Spaces Tuned to Today's Users

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## Abstract

*"Gone are the days of the solemn book-reading experience in the neighborhood library. Activities will be diverse and varied as a way of presenting and interacting with information in new and unusual formats."*

- Thomas Frey, Executive Director and Senior Futurist at the DaVinci Institute

The design and operation of the Mathewson-IGT Knowledge Center at the University of Nevada, Reno focuses on balancing the traditional library role of providing quiet areas and traditional library services with the growing demand for group collaboration, socializing, using and sharing technology, conducting business, and eating and drinking. The building features careful zoning of quiet and active areas, and a range of amenities such as group study rooms, people-watching spaces, quiet reading rooms, plasma clusters, media alcoves, and teamwork booths. The building opened in August 2008 and a space utilization study was conducted in Spring 2009. The study provided detailed data on patron use of these spaces, which was related to design intentions and operational decisions. The study results demonstrate both expected and unexpected trends in the use of the Knowledge Center relating to occupancy rates, seating utilization, observed activities, and differences in these factors across space types and across building levels.

## Knowledge Center Vision and Design Intent

From 1874 to the 1950s, the University of Nevada served as the only state-supported institution of higher education in Nevada. It has since emerged as a doctoral granting institution committed to being accessible and providing teaching, research, and outreach services to its constituencies. For more than a decade, *U.S. News & World Report* has listed the university among the best "National Universities." Student enrollment has surged from 12,500 in 1999-2000 to 17,000 in the fall of 2008.

In both 1989 and 1997, the University received strong recommendations from the accreditation committee of the Northwest Association of Schools and Colleges that the library's physical facility should be expanded. In 1998, a feasibility study was conducted, resulting in the conclusion that a new facility was needed to replace the 40-year old existing main campus library. Selected key issues included:

- Student seating space – needed to be at least doubled
- Collection space – with a collection of well over one million volumes, the library had run out of space and was using a remote storage facility
- New methods of teaching, learning and research - changing patterns in teaching and learning were creating new demands that included:
  - Spaces for group study
  - Noise-controlled areas that foster quiet traditional forms of study in both large reading rooms and carrels
  - Expanded computer labs and campus-wide computing help desk
  - An area for instructional design professionals to collaborate with faculty in creating multimedia instructional materials
  - A faculty and graduate student reading area and faculty carrels
  - Electronic infrastructure to take full advantage of current and emerging technologies
  - Instruction rooms for training in the optimal use of recent technologies and accompanying resources.
  - Expanded areas for preservation and display of the Libraries' Special Collections, including the world-renowned Basque collections

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Campus master planners weighed carefully what a new 21<sup>st</sup> century library should represent. It was a given that the facility will serve as the physical, intellectual, and cultural center of the university. By understanding that knowledge creation and innovation would drive this century's economy, it was clear the new center had to be something more than a traditional repository of bound materials. It also had to be a facility nationally competitive in high technology information dissemination. Some of the key elements included:

- Embedded information technology to explore and utilize multimedia formats
- Access to books and all forms of digital resources through wired and wireless networks
- Availability of information specialists to provide assistance in placing the resources in an appropriate context
- Ample group workspace with extended hours of use
- Social spaces designed for comfort and convenience

Project planning and fundraising commenced in 2001 and focused on defining the building program and establishing the project budget. Schematic design of the Knowledge Center began in 2003, and the building was completed in the summer of 2008. As built, the Knowledge Center is a five story, 295,000 square foot building positioned at the midpoint of the UNR campus. The building serves all of the traditional library service functions and also houses additional resources which are unique to this facility and relate to the project vision. These include the Basque Library and Center for Basque Studies, a high-density automated storage and retrieval system that houses over 50 percent of the library collection, a 163-seat auditorium optimized for lectures and films, and a variety of digital collaboration and multimedia/technology project spaces.

As the project developed, consideration was given to the name of the facility. Since it is far more than a traditional library, the decision was made to call it a "Knowledge Center." It is only through analysis of -- and reflection upon -- data and information that knowledge is created. The Knowledge Center is designed to contribute to new advances in various disciplines by making knowledge creation easier. The center's staff, including both library and information technology specialists, are an integral part of the knowledge creation process, serving as facilitators in delivering context-sensitive information to users and assisting in its transformation into print, digital, audio, and visual information products.

Along with design criteria related to the building's program of spaces and campus standards for materials and systems, the design was driven by several specific design intentions developed by the design team and building committee:

- Intention #1: Provide a variety of space "typologies" that would allow patrons to find their niche for a variety of learning outcomes.
- Intention #2: Provide ample opportunities for student and faculty collaboration in a variety of venues.
- Intention #3: Provide a fully integrated digital infrastructure for use of IT/AV/wired and wireless networks/distance learning/etc.
- Intention #4: Provide separation of active areas and quiet areas. Zone spaces of active, concentrated uses away from traditional, quiet study spaces through both vertical zoning across building levels and horizontal zoning from the atrium edge to the perimeter.
- Intention #5: Provide clear, direct zoning and building wayfinding for ease of patron use and access to services.

Building spaces are organized around a central interior atrium which provides ample natural light and obvious wayfinding cues from the upper four floors, as shown in Figure 1. The majority of public spaces are located around the atrium, providing a range of active and quiet spaces that span from the atrium to the building perimeter. Public space is separated from the "back of house" functions to streamline circulation and limit the perceived size and walking distance within the building.

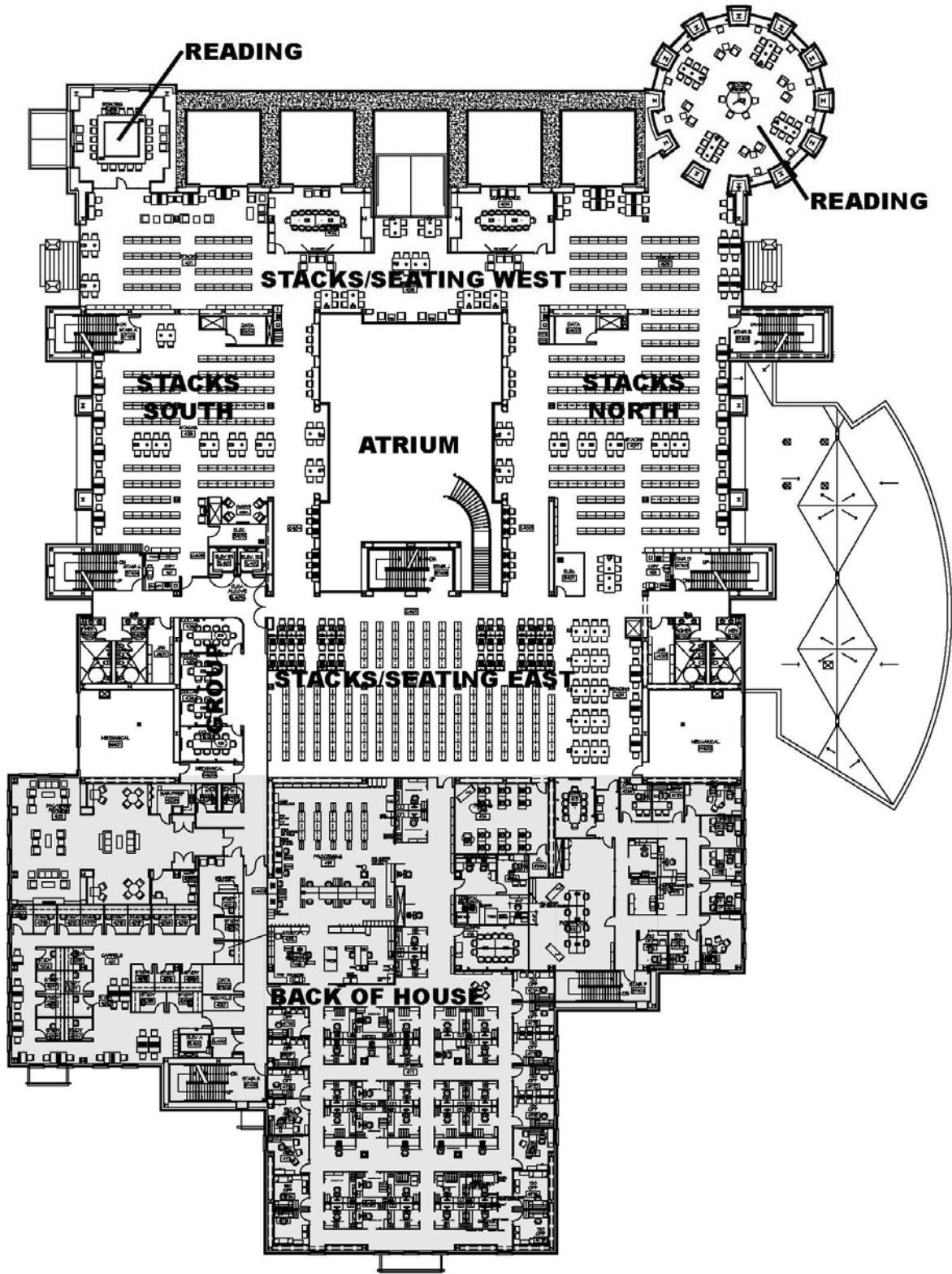


Figure 1. Typical Knowledge Center Floor Plan

## Space Utilization Study Methodology

A Space Utilization Study of the Knowledge Center was conducted in Spring 2009 to examine how patrons are using various spaces in the Knowledge Center, and compare this actual use to the design intent for each space, in order to inform library management decisions and future library design projects. Data was collected using a custom observation form to capture the desired information for each space, including total number of occupants, number of occupants engaging in specific activities, and number of occupants using specific types of seating (in spaces which offer varied seating options).

Activity categories included:

- Reading/writing
- Public computer use
- Personal laptop use
- Projection/screen use
- Eating/drinking
- Production
- Browsing book stacks
- Meeting/discussion
- Interacting with staff
- Other activities

Seating categories included:

- Lounge furniture/café table
- Study table
- Study carrel
- Computer workstation
- Atrium edge

Data was collected through hourly observation over a period of seven days, from a half-hour after opening until a half-hour before closing. The building is open until midnight Sunday through Thursday, with somewhat shorter hours on Friday and Saturday. Staff and student workers recorded occupancy data on hard copy forms. Observation was conducted in April 2009, approximately eight months after the building opened. Observation was scheduled for a period between Spring Break and the final exam period, in order to collect information on typical use patterns. Approximately sixty different spaces were observed, including a variety of specialized spaces, conference or study rooms, computer labs, seating areas, reading rooms, and library stack areas.

Data collection tools were created in advance and distributed to designated observers. A color-coded map of each building level was created to delineate the exact boundaries of each space. Forms were designed which included a data collection table for each space, organized by floor, in a logical sequence for walking observation. One set of forms was filled out for each floor, for each observation time.

In order to effectively discuss trends in observation data, spaces have been categorized as group spaces, traditional library spaces, and computer lab spaces. Data from each of these categories, as well as building-wide analysis, is summarized below.

## Analysis of Group Spaces

Knowledge Center spaces intended for use by active groups of students include:

- Fifteen Group Study rooms located on Levels 2, 3, 4, and 5. These enclosed rooms include a conference table, and plasma screen. The larger rooms also include white boards.
- Two Plasma Clusters located on Level 1. These open areas are located along the edges of the Project Lab and include a plasma screen. Cluster #1 has lounge chairs and Cluster #2 has a table and chairs.
- Three Media Alcoves, located one per floor on Levels 3, 4, and 5. These semi-enclosed spaces have three walls, are located adjacent to the book stacks, and include lounge chairs with tablet arms and a plasma screen.
- Six Booths located on Level 1. These are open areas, along the edge of the Project Lab, with restaurant-style booth seating that can accommodate several occupants.

The Group Study rooms on Level 5 can be reserved in advance; the rest of these spaces are available on a first come, first served basis. The similarities between intended use and provided equipment in these 26 spaces allows for comparison of total occupancy rate, individual versus group occupancy, and observed activities.

Analysis of the fifteen Group Study rooms demonstrates that:

- Group Study rooms were occupied most of the time (70%), and used for multiple occupants more of the time (46%) than by single occupants (24%).
- Group Study rooms were occupied more by groups of occupants on the lower levels of the building, and more by individuals on the upper levels, as seen in Figure 2.

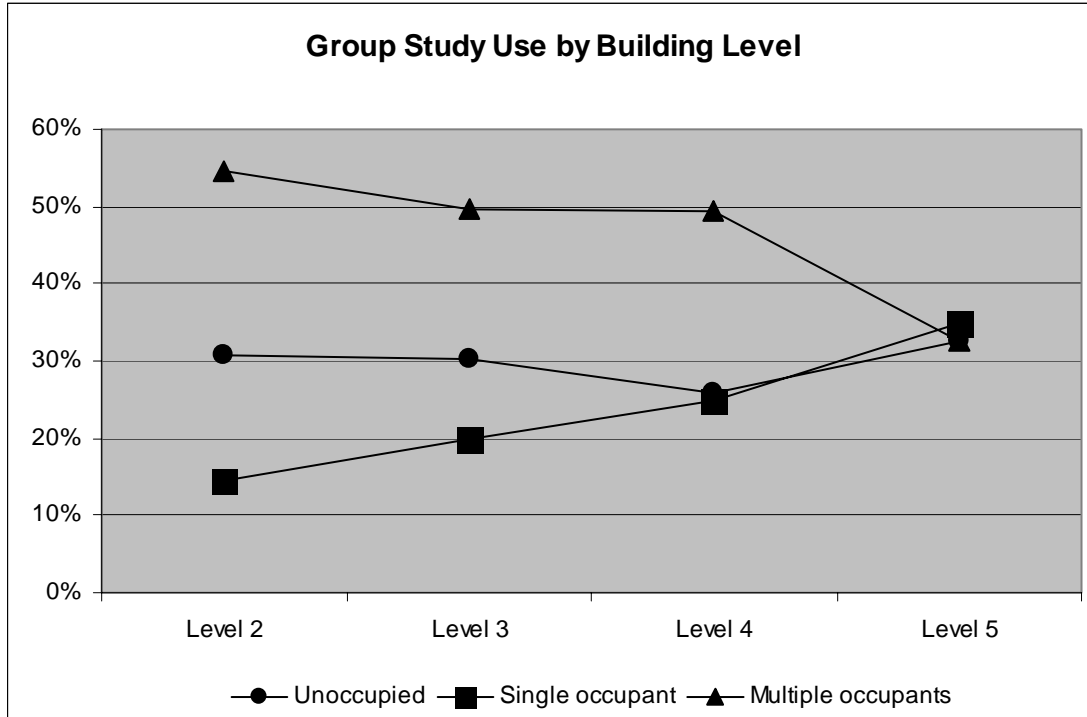


Figure 2. Group Study Use by Building Level

Analysis of the two Plasma Clusters and three Media Alcoves showed that while these spaces were intended for use by groups needing to display/review digital presentations on plasma screens, the screens were never observed in use on Levels 3-5, and the activity most frequently observed was reading/studying. Figure 3 shows the level of observed activities in each space. These five spaces were occupied an average of just 31% of the observed time, and more often by individuals. Figure 4 shows the level of total observed occupancy, including single occupants and multiple occupants, for each space.

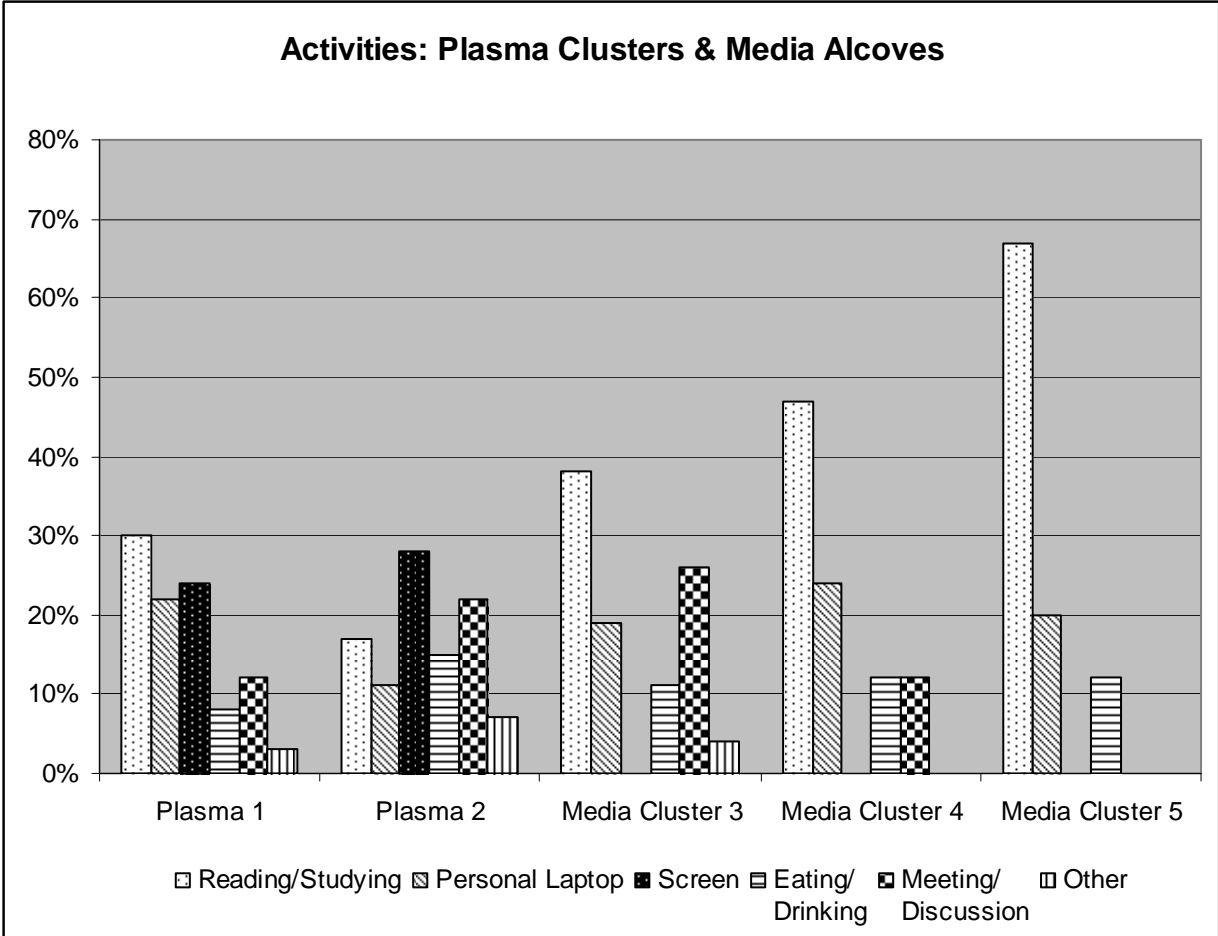


Figure 3. Activities: Plasma Clusters & Media Alcoves

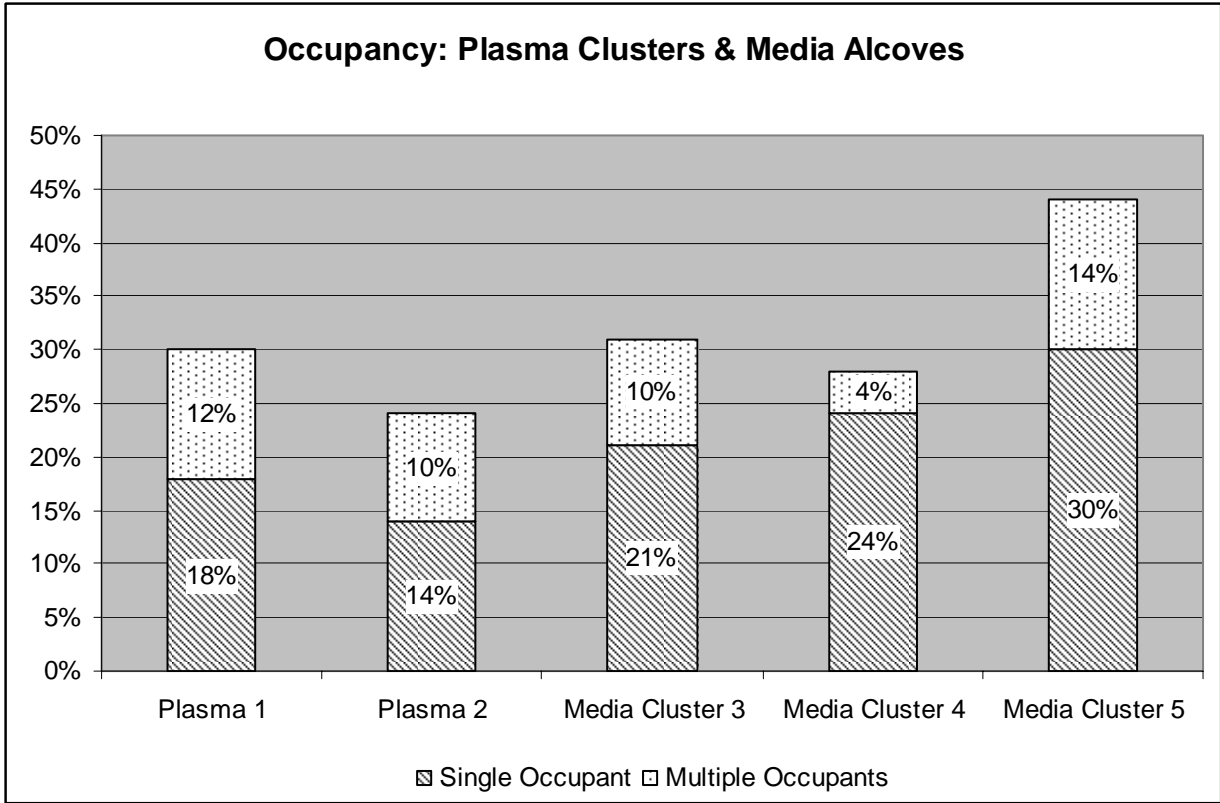


Figure 4. Occupancy: Plasma Clusters & Media Alcoves

The main difference between the Group Study rooms and the Plasma Clusters/Media Alcoves is in the level of privacy provided. Each of these spaces can accommodate at least four occupants and provides access to a plasma screen. The Group Study rooms are fully enclosed, and located away from major centers of activity, while the Plasma Clusters/Media Alcoves have less acoustic and visual privacy. When comparing the averaged data from these two types of spaces, it is evident that Group Study rooms were occupied much more often, and more often by groups of multiple occupants, as seen in Figure 5. As shown in Figure 6, Group Study rooms were also used more frequently for meetings/discussion and less frequently for reading/studying, while the level of laptop use was similar in both types of spaces.

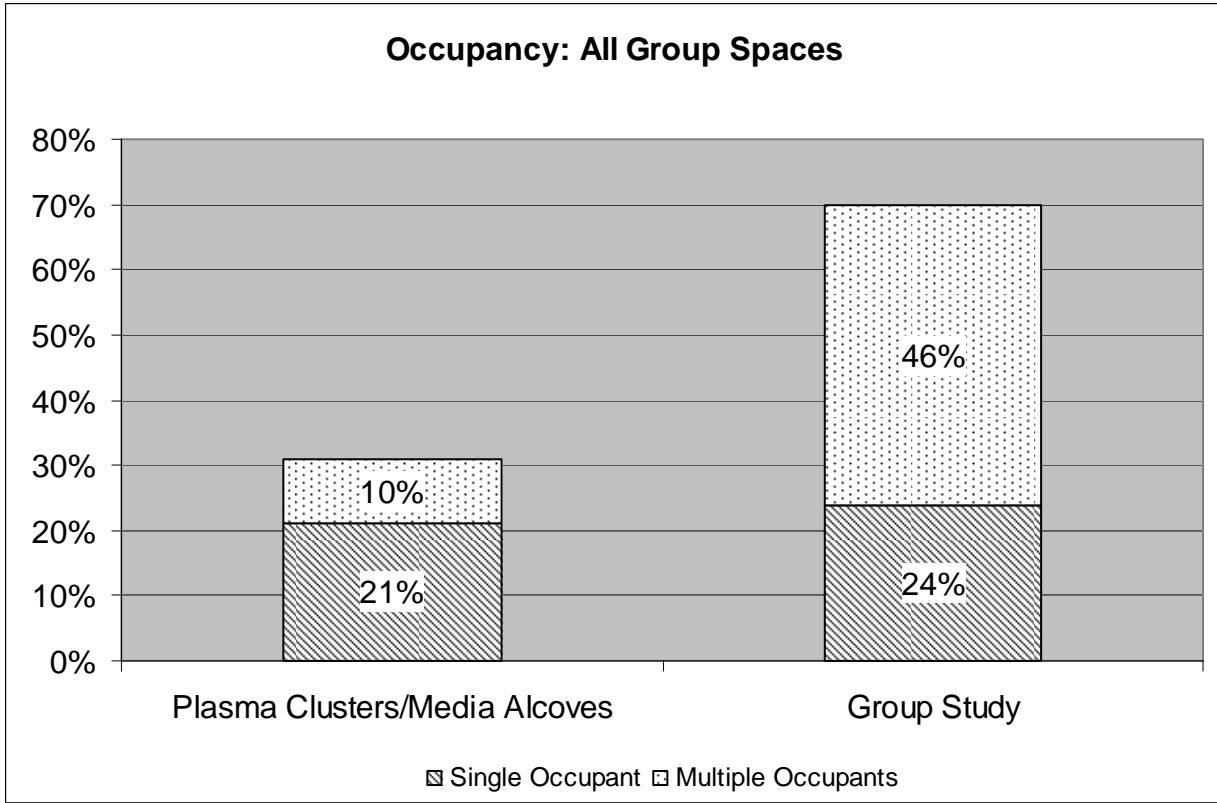


Figure 5. Occupancy: All Group Spaces

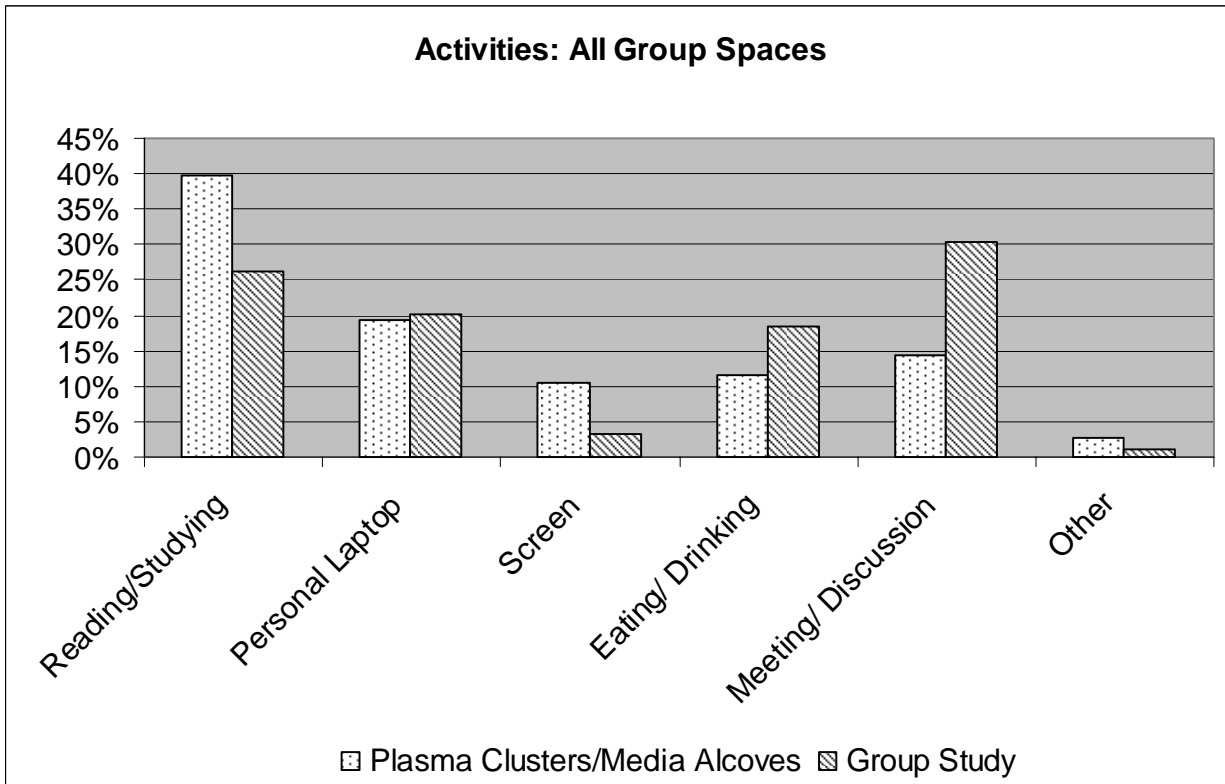


Figure 6. Activities: All Group Areas

The Booths were also intended for group use, but differ from the other group spaces in that access to display screens is not provided. Observation data showed at least one booth was occupied 94% of the total time observed, but all six booths were only occupied simultaneously 17% of the time (Figure 7). This is surprising given that staff perceive a very high demand for booths. Figure 8 shows that the most frequently observed activity was reading/studying, with significant observation of laptop use and eating/drinking, and some observation of meetings/discussion.

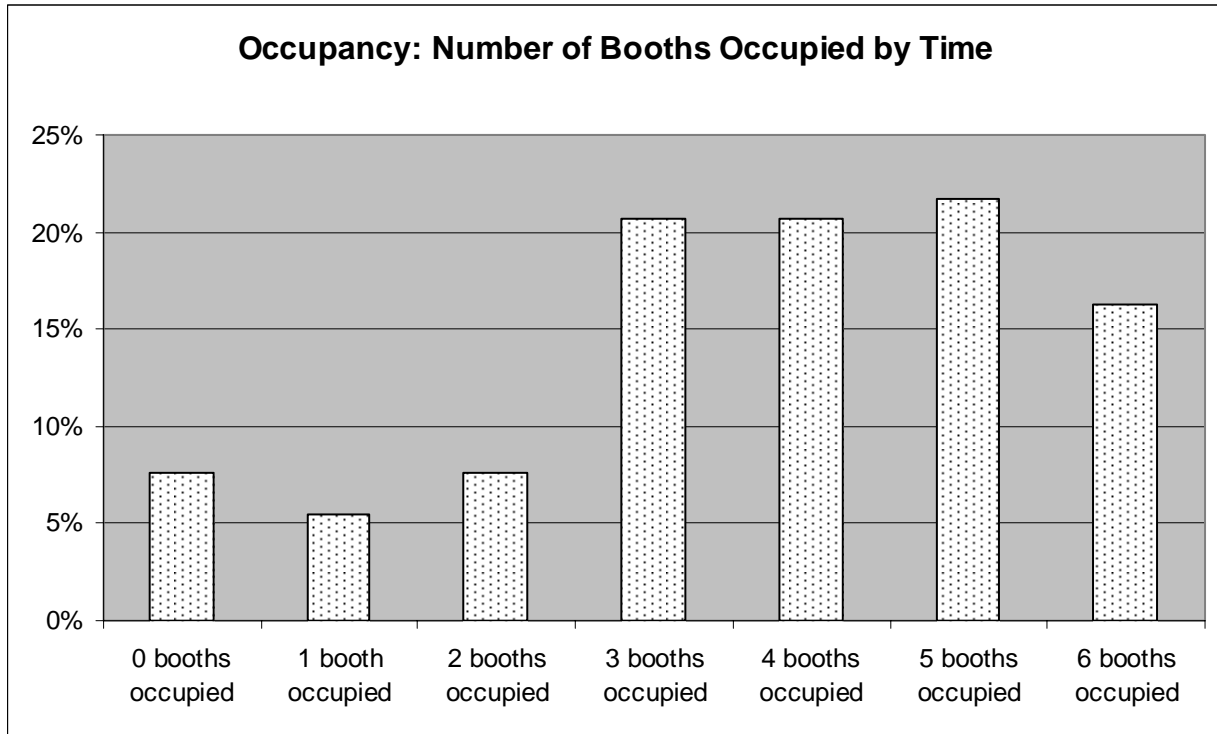


Figure 7. Occupancy: Number of Booths Occupied by Time

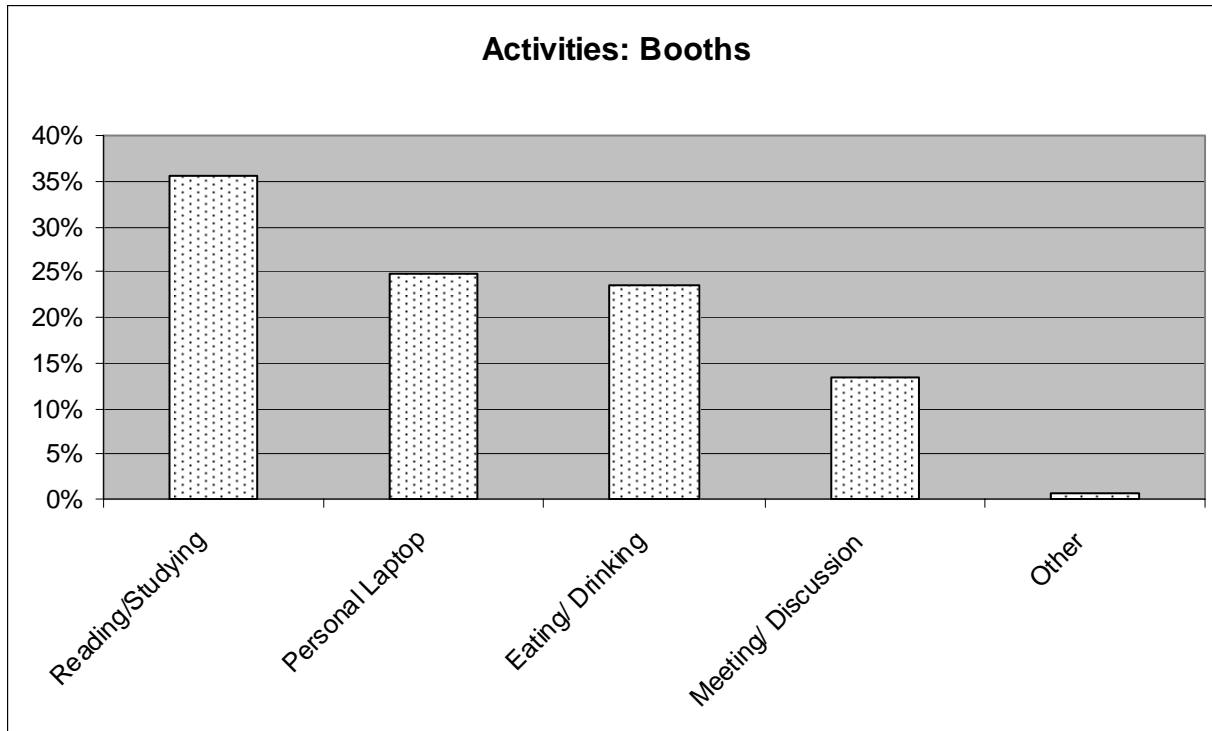


Figure 8. Activities: Booths

### Analysis of Traditional Library Spaces

Observation was conducted in fifteen open areas of book stacks and seating and six enclosed reading rooms on Levels 3, 4, and 5. The Open Stack areas vary in amount and variety of seating, amount of book shelving, and proximity to the atrium. Eleven of these areas are general spaces which are fairly similar on each level of the building. The other four are more specialized areas located on Level 2, specifically Reference, Popular Reading, Microforms, and the Atrium. Four of the six reading rooms are for general quiet study use. The other two are associated with specialized library spaces and are known as the Basque Reading Room and the Special Collections Reading Room.

On average, these traditional library spaces were occupied by at least one patron during 89% of observation times. The average utilization based on seating capacity was 20%. The utilization of the open stack areas decreases by building level, from 27% of the 213 seats provided on Level 3, to 21% of the 290 seats on Level 4, and 13% of the 301 seats on Level 5, as shown in Figure 9. The average utilization of the reading rooms ranges from 4%-13%, as shown in Figure 10. The number of seats provided and average utilization for each space is:

- Tower Reading 300: 20 seats, 7% average utilization
- Basque Reading: 25 seats, 13% utilization
- Special Collections Reading: 18 seats, 6% utilization
- Rotunda Reading 406: 48 seats, 6% utilization
- Tower Reading 400: 16 seats, 4% utilization
- Tower Reading 500: 20 seats, 10% utilization

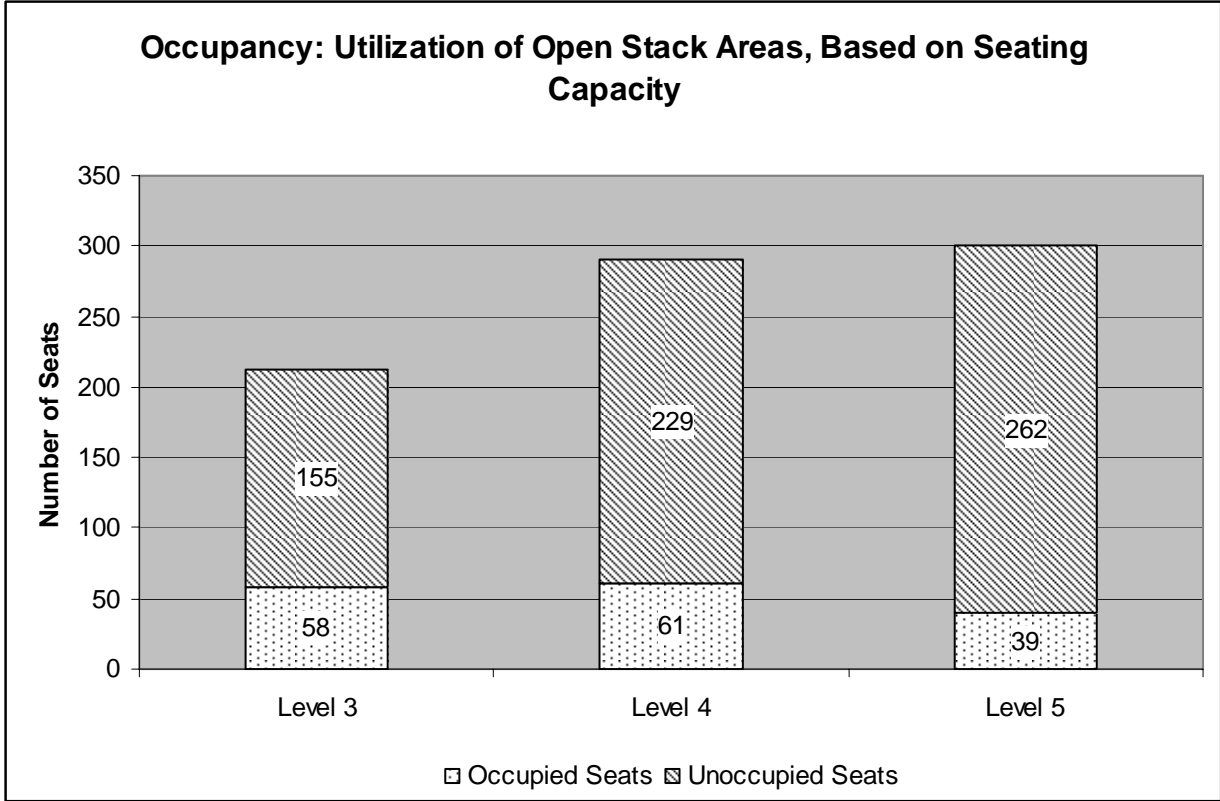


Figure 9. Occupancy: Average Utilization of Open Stack Areas by Floor, Based on Seating Capacity

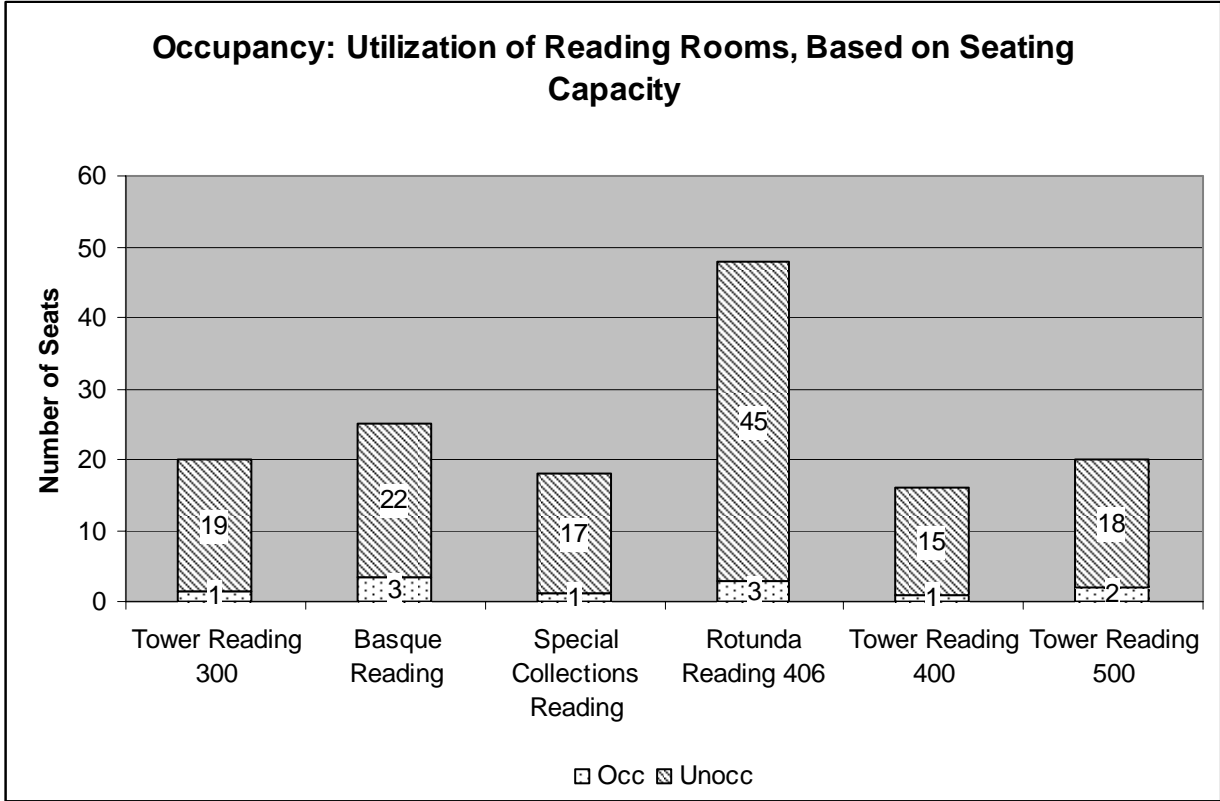


Figure 10. Occupancy: Average Utilization of Reading Rooms, Based on Seating Capacity

Comparison of the activities witnessed in the designated reading rooms with those in the open stack areas shows similar levels of eating, laptop use, and meeting/discussion, as shown in Figure 11. The frequency of observed reading/studying was slightly higher (37%) in the designated reading rooms than in the open stack areas (30%). Two other significant differences were a higher level of public computer use in the stack areas, since computers are not provided in most reading rooms, and high levels of interaction with staff in reading rooms. This was due to a high level of staff interaction in the two specialized reading rooms (Basque and Special Collections); there was no staff interaction in the general quiet study reading rooms. Across all of the open stack areas, only 1% of observed activities included browsing book stacks, and less than 1% involved patrons interacting with staff.

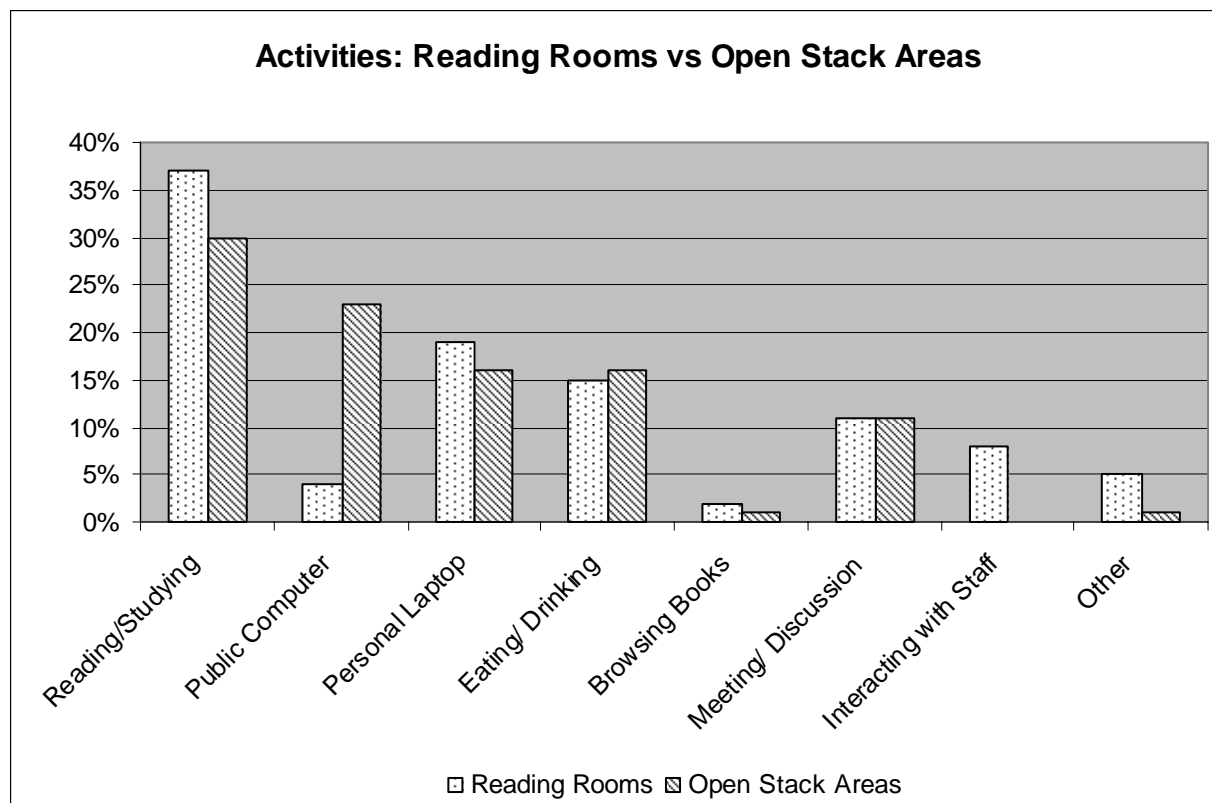


Figure 11. Activities: Reading Rooms vs. Open Stack Areas

Slightly different information emerges when sorting the data by building level and limiting data to the typical stack spaces which are similar on each building level, by excluding the specialized areas on Level 2. Level 5 shows a significantly higher level of observed reading/studying, and the amount of meeting/discussion varies significantly by level, from just 1% on Level 5, to 14% on Level 4, to 21% on Level 3, as shown in Figure 12.

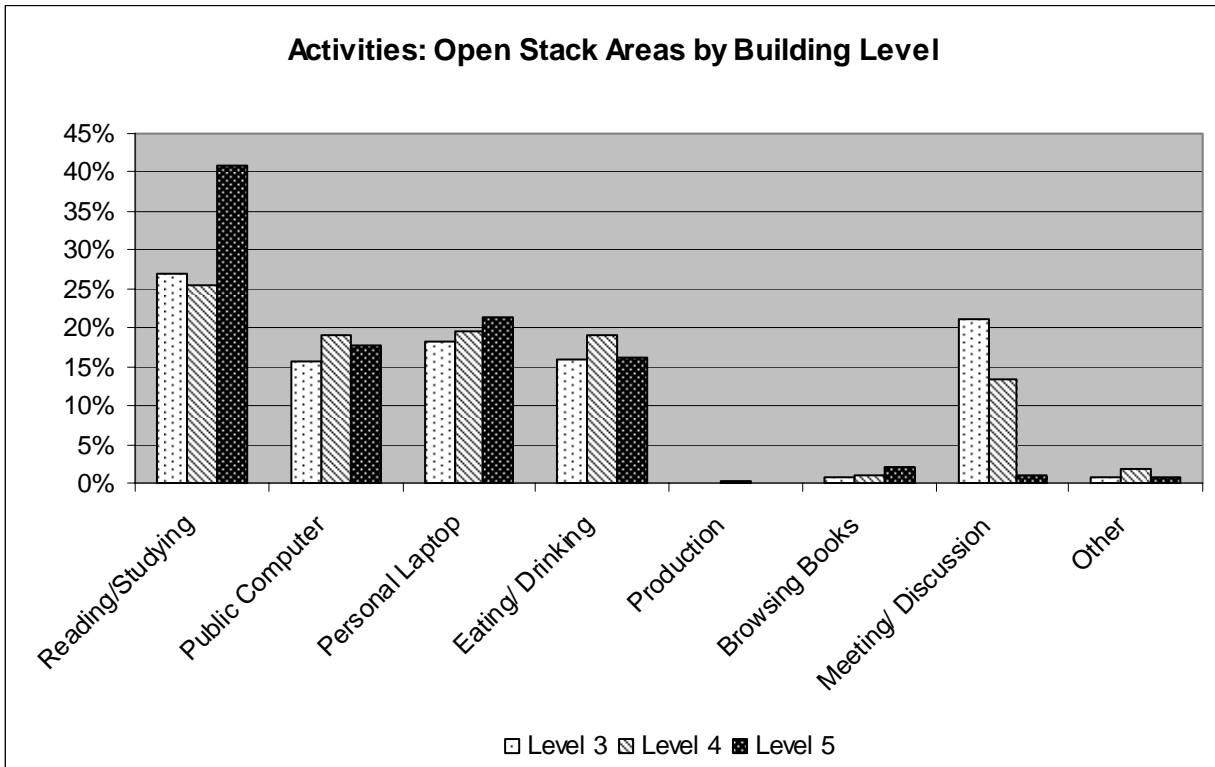


Figure 12. Activities: Open Stack Areas by Building Level (typical stack areas only)

The traditional library spaces offer a variety of seating options on Levels 2 through 5, including:

- Lounge chairs (181 seats): soft seating typically arranged in conversational groupings. Some lounge chairs are located along the edge of the atrium, while others are within book stack areas.
- Tables (777 seats): wood study tables. Tables typically seat up to four people, but a few 6-person tables are located in quiet reading rooms. Included in this category are café tables with approximately 100 seats.
- Carrels (145 seats): traditional wood study carrels with privacy panels. Each carrel seats one person.
- Computer stations (175 seats): wood furniture with divider panels and wire management. Each station seats one person, and stations are arranged in a variety of groupings.
- Atrium edge: a variety of seating options are available immediately adjacent to the atrium on Levels 3, 4, and 5. This includes counter seating, counter seating with public computers, tables, and lounge chairs.

These seating options are distributed throughout the Knowledge Center, but none of the traditional library spaces include every type of seating. Analysis of the utilization rates of different types of seating shows that the public computer stations were the most frequently occupied type of seating, as shown in Figure 13. Tables had the lowest utilization rate of 10%.

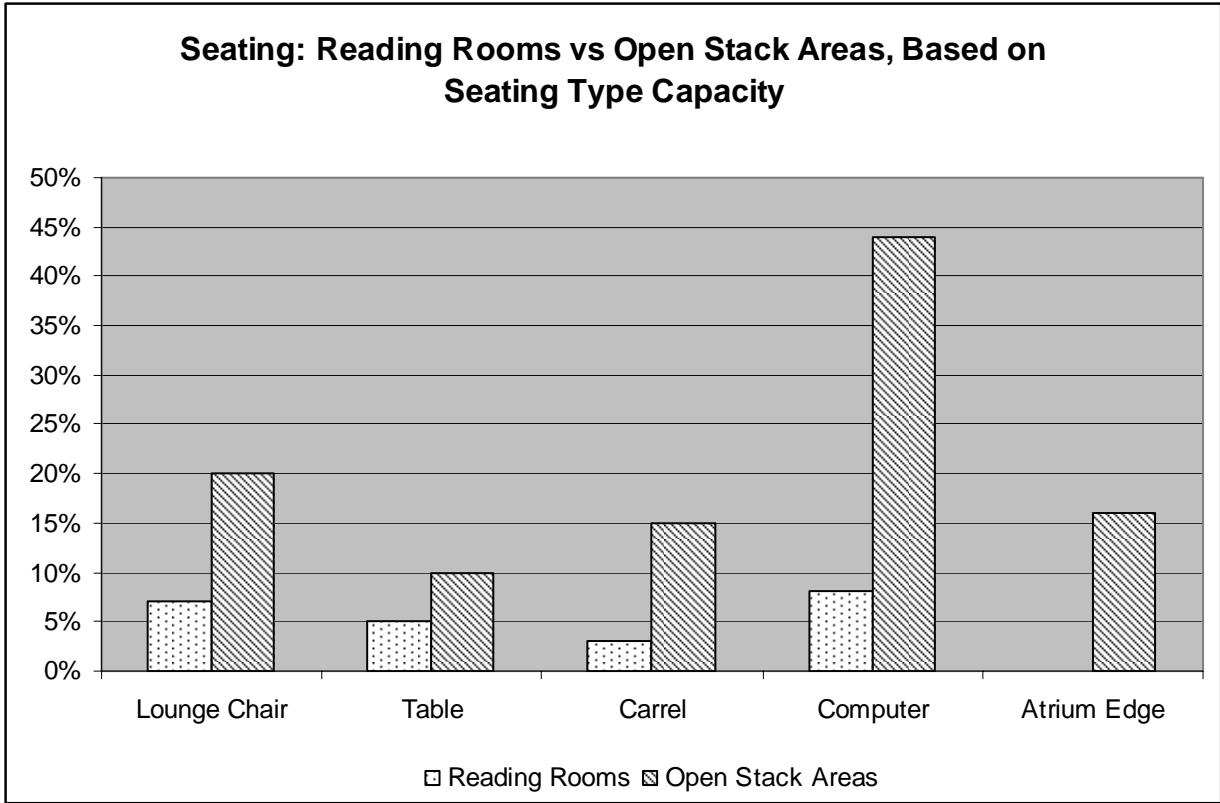


Figure 13. Seating: Reading Rooms vs Open Stack Areas, Based on Seating Type Capacity

The type and amount of seating at the atrium edge is different on each building level. Level 3 offers a mixture of counter, counter with computer, table, and lounge seating for a total of 48 seats. Level 4 provides a similar mixture of seating types, for a total of 61 seats. Level 5 offers 40 seats, consisting entirely of tables. There are also differences in the physical environment. Level 3 provides the closest vantage point to the occupied atrium space on Level 2. The seating on Level 5 is separated from the atrium by glass windows, while the seating on Levels 3 and 4 is adjacent to open railings. Figure 14 shows that the utilization of the atrium edge seating decreases with building level.

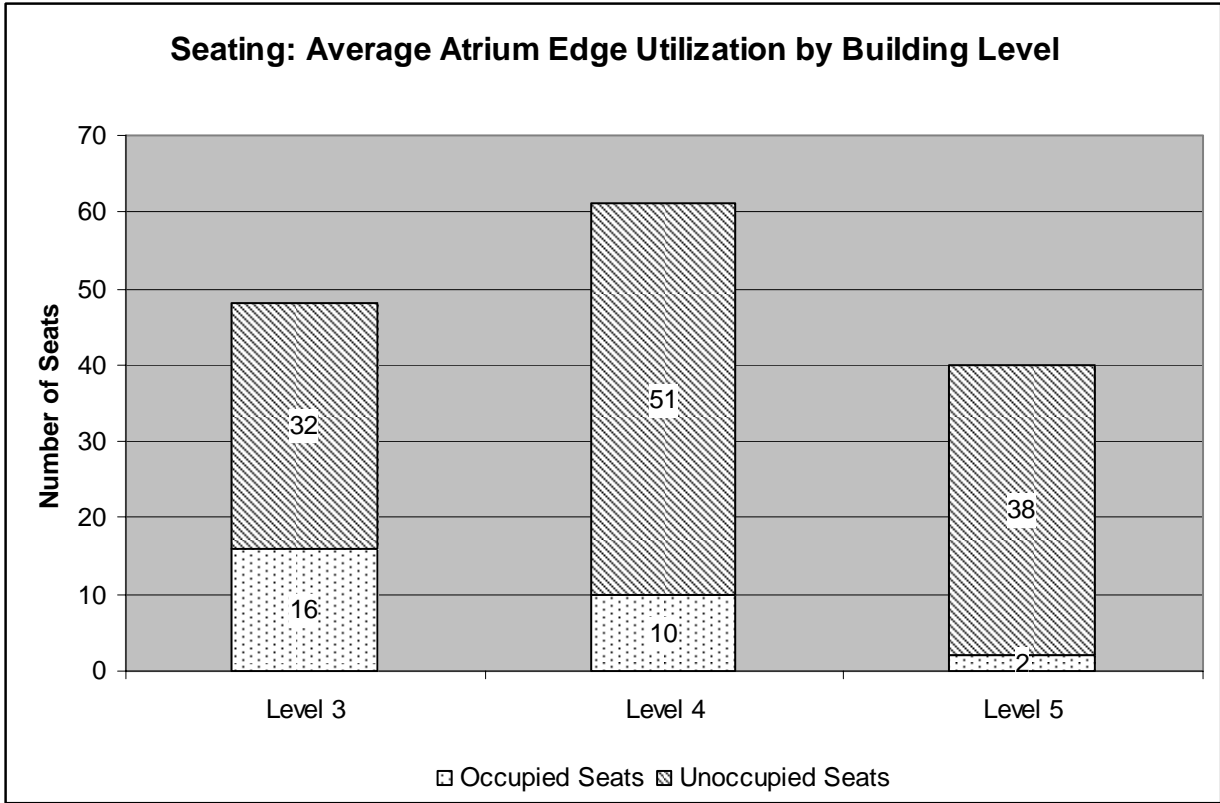


Figure 14. Seating: Average Atrium Edge Utilization by Building Level

**Analysis of Computer Labs**

Several computer labs are located on Level 1, and an additional Training Lab is located on Level 4. The labs are a mixture of general use labs such as Production 123 (99 seats) and Computer Training Lab 114 (25 seats), specialized labs such as Media Lab 108 (18 seats) and Dataworks Lab 121 (18 seats), and rooms that are typically reserved in advanced and kept secured such as the videoconferencing rooms and Training Lab 414 (12 seats).

Figure 15 shows that three of the labs were occupied over 90% of the observed time, including Production 123, Media Lab 108, and Dataworks Lab 121. The rooms which have restricted access were observed in use the least amount of time. The largest lab, Production 123, had the highest observed utilization by seating capacity at an average of 52% over the observation period. The Dataworks and Media Labs had fairly high utilization rates as well, as shown in Figure 16.

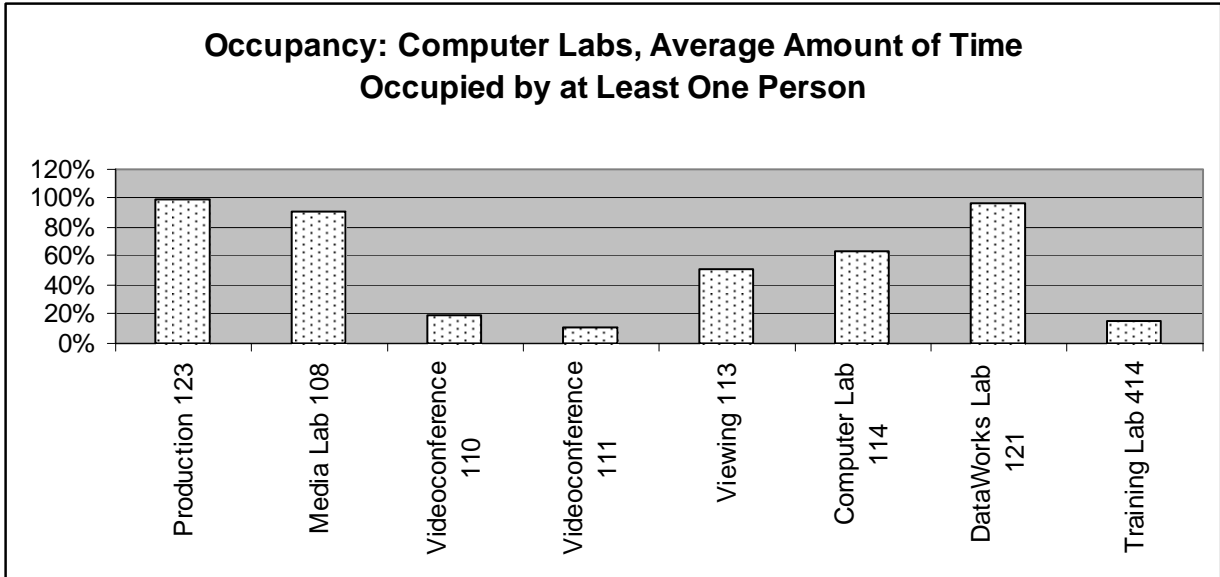


Figure 15. Occupancy: Computer Labs, Average Amount of Time Occupied by at Least One Person

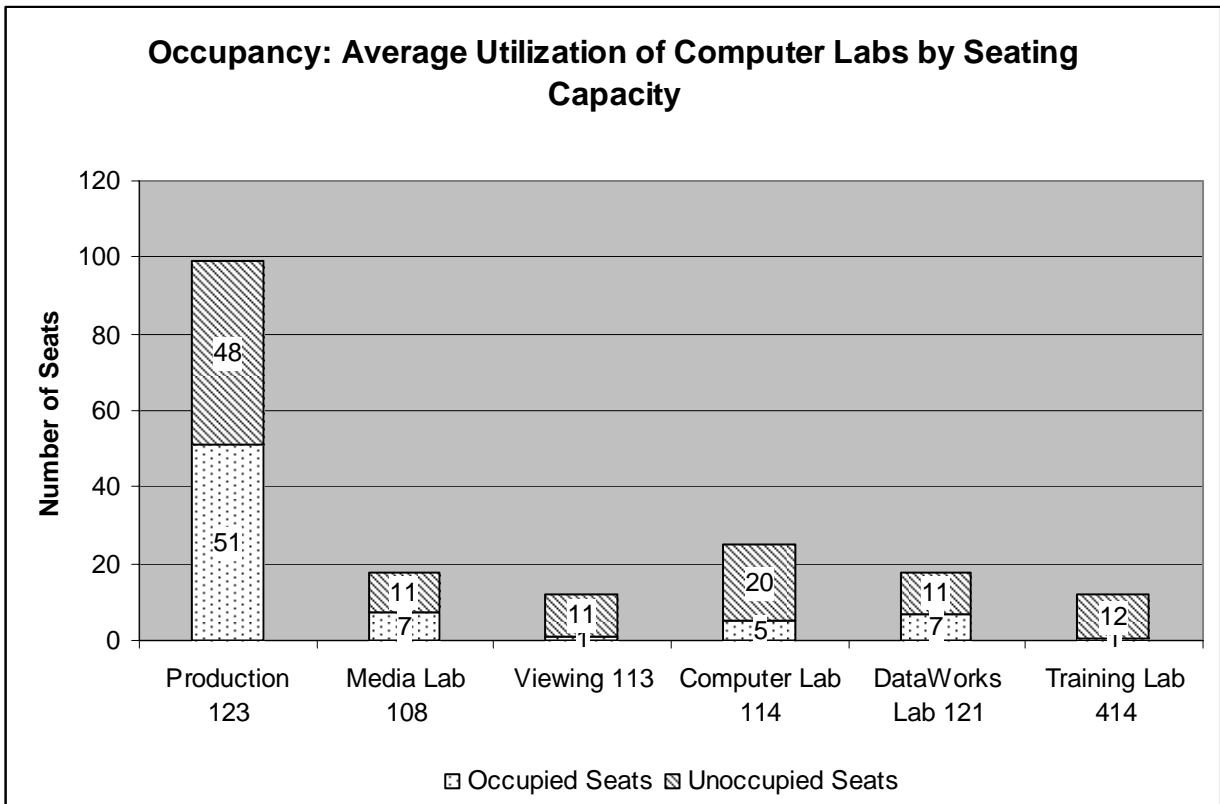


Figure 16. Occupancy: Average Utilization of Computer Labs by Seating Capacity

**Building-wide Analysis**

Building-wide, across all space types, the most frequently observed activity was reading/studying (26%), followed by nearly equal amounts of laptop use (16%), eating/drinking (16%), and meeting/discussion (17%) as shown in Figure 17. The least frequently observed activities were patrons interacting with staff (2%), browsing of book stacks (2%), and production of materials (1%). Activities noted within the “other” category included sleeping, computer gaming, cell phone use, walking through spaces, waiting in line,

headphone use, watching movies, white board use, playing chess, playing cards, and looking out windows.

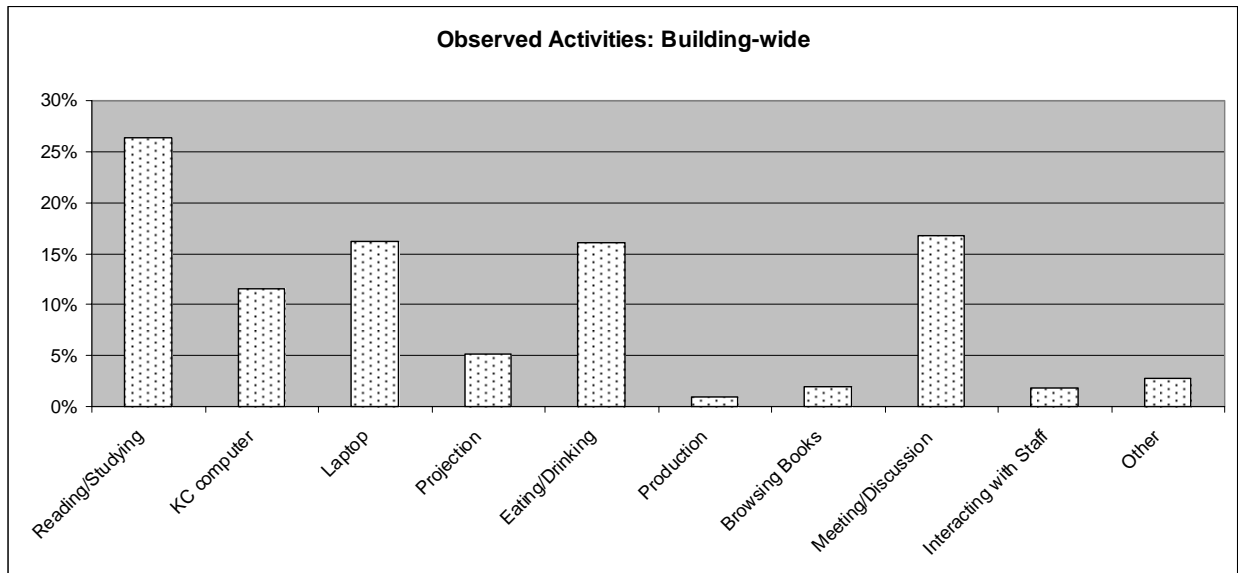


Figure 17. Observed Activities: Building-wide

Looking at observed activities by building level, some additional patterns emerge, as shown in Figure 18. The observed frequency of reading/studying on Level 5 is much higher (40%) than the building-wide average of 26%. The highest level of public computer use occurs on Levels 1 and 2; these two levels have a corresponding low rate of personal laptop use. Only Level 1 has frequent use of projection/plasma screens at 15%; the remaining levels have less than 5% screen use. Levels 1 and 5 have significantly lower levels of meeting/discussion activity, with 8% and 11% respectively, compared to the building average of 17%.

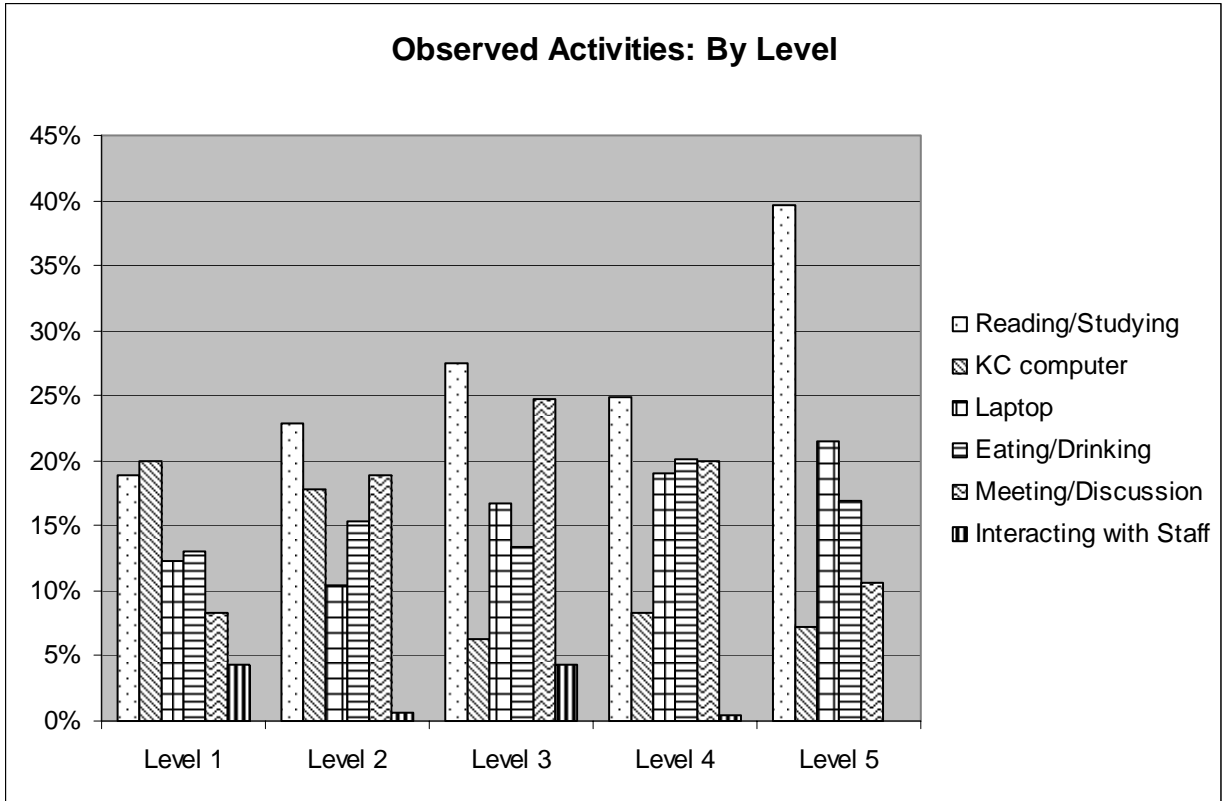


Figure 18. Observed Activities: By Level

Building-wide, across all space types, spaces were occupied by at least one person an average of 72% of the time observed, as shown in Figure 19. The average utilization, as a percentage of the seating capacity, was 21%, as shown in Figure 20. Level 2 had both the highest average for amount of time occupied (83%), and for average utilization (39%). Average utilization decreased with building level, with a low of 13% on Level 5.

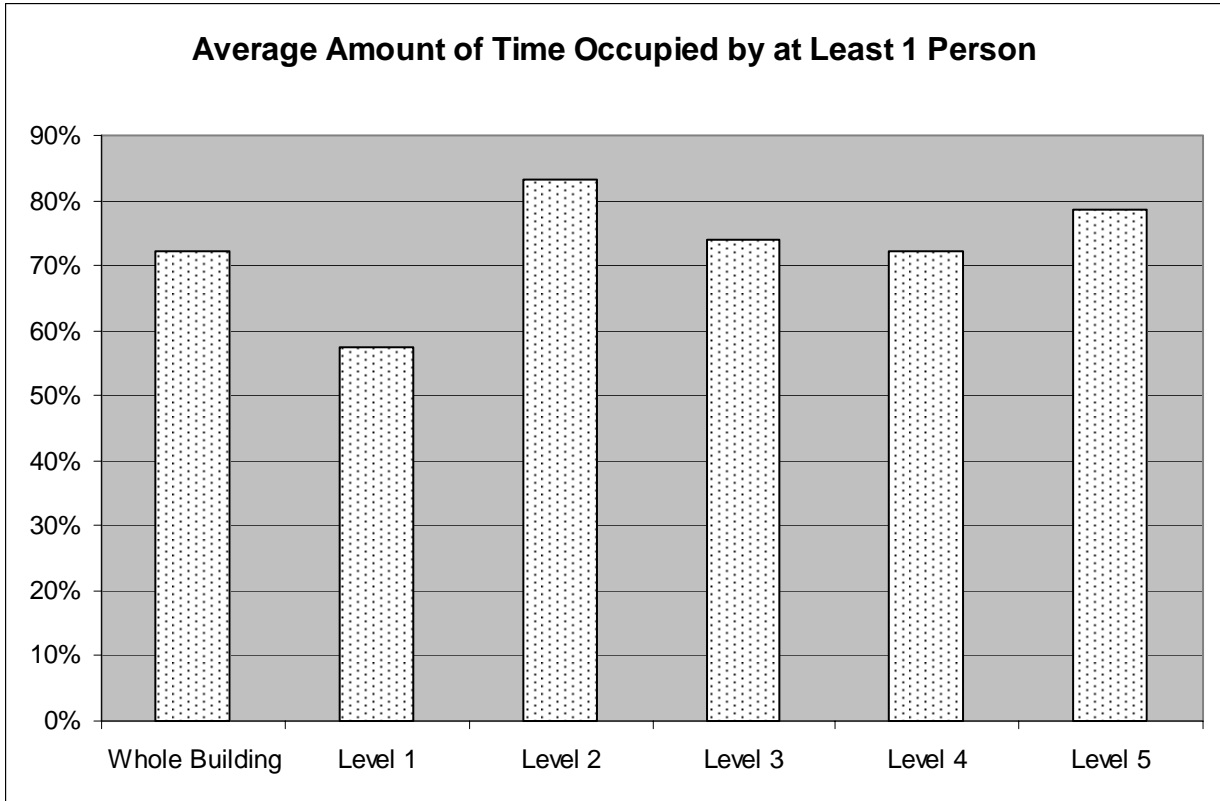
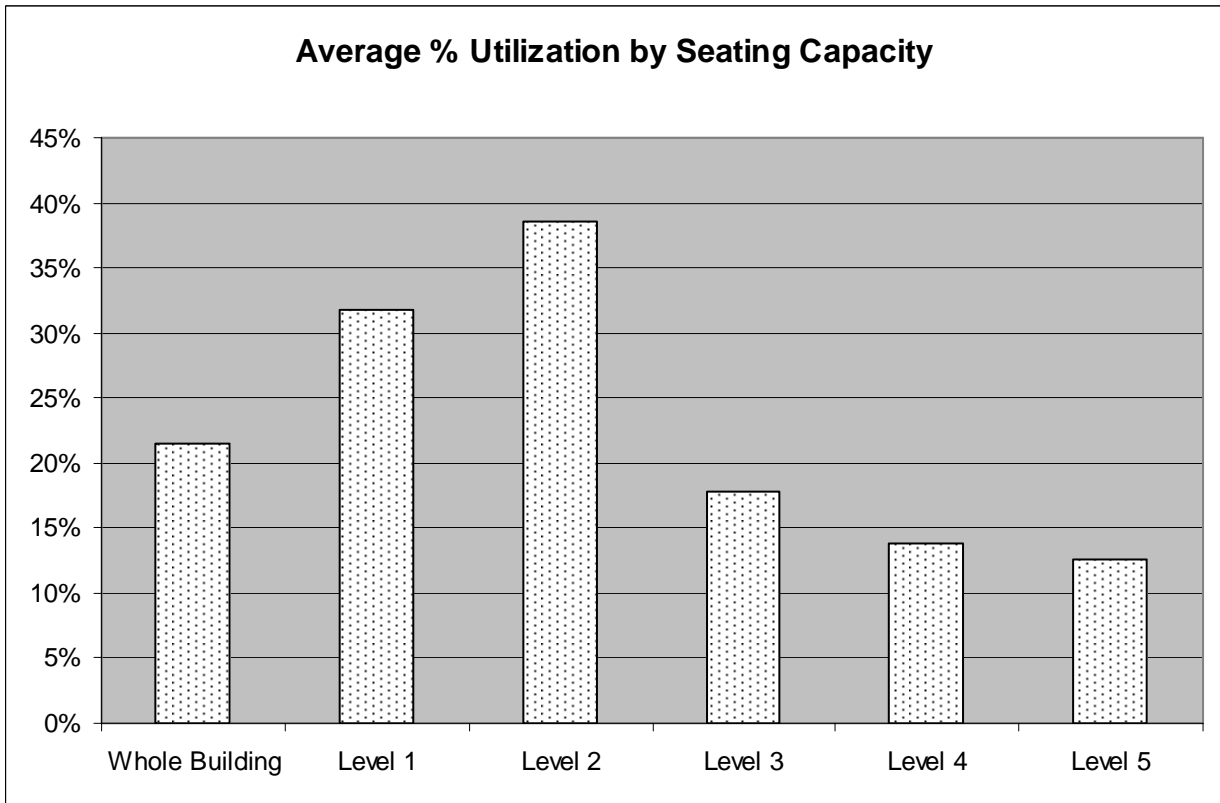


Figure 19. Amount of Time Occupied by at Least 1 Person



*Figure 20. Average % Utilization by Seating Capacity*

## **Conclusions**

The Space Utilization Study uncovered both expected and unexpected trends in the use of the Knowledge Center. These findings, and possible explanations for them, are discussed below by space type.

A variety of spaces for group collaboration were provided in the Knowledge Center to address a perceived need for small and large group rooms, enclosed and open areas, and amenities such as plasma screens and white boards. Observation data showed that the Group Study rooms were used more frequently than the Plasma Clusters and Media Alcoves. Students may prefer the higher level of privacy, and ability to talk freely without disrupting others, offered by the fully enclosed Group Study rooms, compared to the entirely open Plasma Clusters and partially enclosed Media Alcoves.

Group Study rooms were used more often by multiple occupants than the Plasma Clusters and Media Alcoves. This may be influenced by the intended use of each building level. Group Study rooms are fairly evenly distributed on Levels 2 through 5, both Plasma Clusters are located on Level 1, and Media Alcoves are located one per floor on Levels 3 through 5. Knowledge Center staff believes that the first floor is used mainly by students for its specialized production capabilities; it does not seem like the place to go for collaboration, which may contribute to the low use of the Plasma Clusters. An operational decision was made during construction to designate Level 5 as a quiet study floor. Due to this, groups are unlikely to use the Media Alcove on Level 5 since it is only partially enclosed.

Group Study rooms were more often used by groups on the lower levels of the building, and by individuals on the upper levels. Since most students enter the building from Level 2, this may be due to convenience, with students selecting the first available room. The designation of Level 5 as a quiet study floor may also make groups less likely to gather on this level.

Both the Plasma Clusters and Media Alcoves showed a low level of occupancy, and the plasma screens were never observed in use in the Media Alcoves. All five spaces were most often occupied by individuals, and the most frequent activity was reading/studying. This suggests that the demand for access to display screens may have been overestimated, and that these spaces may be functioning more as a comfortable place to read, since four out of five spaces are furnished with lounge chairs. Many students may also be unaware of the Media Alcoves, since they are small areas located within the open stacks and are not highly visible.

The Booth spaces on Level 1 had a high level of perceived occupancy and popularity, which was not fully supported by the observation data. These seem to have a high level of individual use, and use for reading/studying, rather than for group work. Again, this may be due to the trend of individual focus on Level 1 compared to the upper levels.

The use of spaces intended for group work by individuals emphasizes that design intention and space naming do not determine human behavior. Students will select the environment that serves their needs, which may include the privacy, technology, or ability to spread out materials, of larger spaces. If the occupancy rates of group study rooms increases to the extent that they are fully occupied, groups may begin to use the less private spaces such as Media Alcoves and Booths, more frequently.

The data from the traditional library spaces - open stack areas and reading rooms - also offered some expected and unexpected trends. Not surprisingly, the highest level of observed activity throughout the building was for reading/studying, followed by significant amounts of public computer and personal laptop use, and eating/drinking. Level 5 showed the greatest amount of reading/studying and least amount of meeting/discussion, which relates to its designation as a quiet study floor. Across all of the open stack areas, only 1% of observed activities included browsing in the book stacks. While this is something of a surprise, it can be explained by several factors. First, the number of bound volumes circulated from the main collection has declined from around 250,000 in 1995 to less than 210,000 in 2008. Second, many of

the books that patrons are using, including all bound journals, are housed in the automated retrieval system and retrieved directly from the circulation desk. And most significant, students and faculty much prefer to use electronic books and journals, and the majority of the library's current purchases are for electronic resources.

Seating utilization in the open stack areas averaged 20% of seating capacity, and decreased by building level from Level 3 to Level 5. Reading room utilization ranged from 4%-13%; these results are not surprising. Although not all seats are filled, the general impression during the busier hours is that the areas are popular with many students for small groups and individual study.

In the analysis of seating type, public computer stations had significantly higher use rates, and tables had the lowest utilization rates. This may be partially due to the inherent nature of four-person tables, compared to individual lounge chairs, carrels, or computer stations: typically if one person is sitting at a table, other patrons will select an empty table rather than join an unknown person at a table, resulting in occupancy of only one person per table.

The computer labs showed high levels of occupancy and utilization for three labs in particular: Production 123, Media Lab 108, and Dataworks Lab 121. If anything, library staff had expected the survey results to show even higher percentages of occupancy. These high-end technology resources have been very popular with students and faculty. More faculty are making assignments based on the technology resources in the Knowledge Center, and use of the labs is expected to rise to maximum occupancy for much of the coming semester.

The occupancy and activity patterns observed in this study may change over the life of the building, which is still in its first year of occupancy. If these patterns persist, and if changes are desired to improve occupancy levels, the building may be easily modified to better meet current demand. The designations of enclosed rooms as either group study or quiet study can be changed, since an enclosed space offers the opportunity to either contain noisy activity or separate patrons from adjacent noisy activity. Use of technology such as plasma screens can be promoted through greater awareness of these resources, or the screens can be relocated to more appropriate areas, such as spaces offering greater visual and acoustic privacy. Seating can be relocated to optimize space use by providing the most appropriate type of seating for the activities occurring in each space.

Although open less than a year, the Knowledge Center is already fulfilling many of the goals envisioned by the design team and the building committee. Students are taking advantage of the opportunity to use technology resources, and to find a space to work in the building that meets their needs, whether that includes quiet focus, collaboration, or socializing. Staff expects the level of space utilization, particularly for areas offering opportunities for group study or technology use, to increase as more of the student body becomes aware of the resources available at the Knowledge Center. The building is also expected to adapt well to changing patterns in space use and continued evolution of new technologies as it serves as the physical, intellectual, and cultural center of the university for decades to come.