Using Mobile Technology for Studying library Spaces

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Abstract: Traditional methods for tracking library building use, such as gate counts, provide little information on what patrons actually do once they are in the library. New methods for studying space usage, such as observation of user behaviors throughout the library's study spaces, can be labor intensive. Mobile technologies provide an efficient method to track observations of patron's study behaviors and provides quantitative data for the typically qualitative observation methodology.
Keywords: Mobile technology, library space studies, observation methodology, data collection, iPad, CloudOn, Counter+

1. Introduction

In the last decade or so, as electronic resources and the virtual presence of the library on the web have become more important, libraries have increasingly been interested in understanding how patrons use the library's physical facility. "Traditional library statistics used to measure library facility use employ data such as gate counts and circulation statistics" (Dotson and Garris, 2008). Gate counts tell us how many people enter and leave a library, but they do not tell us how they use spaces within the building once they are in it. Johnson and Finley discovered that counting the number of users in computer labs and in study areas provided more detail on library usage than mere gate statistics was capable of doing (2013). Christopher Stewart also emphasized the importance of moving "beyond general observation and broad metrics such as gate counts to assess the effectiveness of new spaces beyond the mere fact people are in the space" (2011).

Over the last decade several new methods have been developed to study space usage in libraries. Simple observation is one of the most common methods. Khoo, Rozaklis, and Hall found that observation was used in over 80% of the ethnographic methodologies they studied (2012). Direct observation has the advantage that it records the behaviors of actual users in specific locations and at specific points in time. Other methods, such as surveys and interviews, may be less accurate and less revealing. They depend anecdotally on the memory of

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the interviewer or the person surveyed. (Pierard and Lee, 2011). The chief drawback of observation is that it is time-consuming and labor-intensive. Ideally, a solution can be found to take advantage of the strengths of the observation methodology while lessening the work of data collection.

2. CSUSM need to track space usage

At California State University San Marcos (CSUSM) we decided it was time to assess building use in 2014, ten years after the completion of our new library. CSUSM is located in north San Diego County, one of the 23 campuses that make up the California State University system. The campus itself is just 25 years old and has recently topped the 10,000 student mark. The library has grown with the campus. It currently occupies its own building, with 200,000 square feet, and over 500,000 physical and electronic volumes. Our original design focused on student usability. After ten years we felt it was appropriate to determine whether our original decisions had been effective, and whether changes were needed to accommodate the still-growing student body. In particular, we were curious to know how the newly built student union, adjacent to our building, was affecting library use.

We decided that observation would be the best methodology for understanding how much students were using the different study spaces in the library. We were also interested in tracking certain types of study behaviors, particularly students working in groups and students using their own technology vs. those using the library's computer facilities. We realized that recording such a variety of data points across our large facility could be quite labor intensive. Therefore, before undertaking our space study, we decided to find a more efficient data collection tool for conducting observations.

2.1. Mobile technology to track space usage

Direct observation requires being actually present in the spaces to be observed, and this means moving freely about the library. Data collection requires easy access to the electronic technology on which data is recorded. Much of the time spent on data collection involves transferring observations made on portable paper tablets to desktop data storage devices. It seemed obvious to us that some form of mobile technology would significantly improve our ability to collect complex data specific to our library's needs. In investigating specific technology solutions we looked at two areas: mobile devices and mobile applications.

We defined mobile devices as handheld computers that enable staff to complete their work in the field. Devices we considered included portable computers, tablet computers, e-readers, portable barcode readers, and smart phones. E-readers and portable barcode readers proved to be too specialized for our purposes. We decided to focus on laptops, tablets, and smart phones instead. Each type of device had its strengths and its weaknesses.

The chief strength of laptops was that they gave us the full power of a desk computer, including spreadsheets and other software traditionally used in the collection of data. However, while laptops were technically "portable," in the sense that they can be carried around, we found that they were awkward to use. It was generally best to set them on a flat surface before entering data, and they were obvious and obtrusive, making semi-clandestine observations impossible.

Smart phones, by contrast, were truly portable and discrete. They could be used anywhere, either standing or walking. Moreover, the wide array of apps available offered a number of data gathering options. However, the apps could not be easily converted into the standard desktop software formats, such as standard spreadsheets, to facilitate statistical analysis. We found that it was difficult to input large amounts of complex data we wished to gather in the software provided on this type of device

Tablets proved to be the best choice for most situations. Smaller than laptops, they offered the necessary portability and ease of use; but they also offered the necessary standard software for collecting and processing complex data. The new generation of light-weight tablets, with touch screen technology, proved to be especially appropriate to our needs.

We decided to use tablets for most of our data gathering activities; but, smart phones seemed best in certain cases, where complex data was not required.

Of course, a mobile technology is only as good as the software it supports. We also gave some thought to the most useable software application for our devices. We found it convenient to think in terms of two types of software: downloadable apps and cloud-based apps.

By downloadable apps we meant ready-to-go apps that can be downloaded onto the mobile device from the Internet, although they do not require an internet connection to be used. Such apps often have a single use, but they rarely require technical support, and are easy to install and maintain. We tested *Counter+* for use in our study. This app, for iPhones and iPads, is a simple 'clicker' app. That is, you merely touch a button to record a particular event. It provides up to eight counters, which can be customized to record the various events that you wish to observe. The results can then be emailed to another data collection device at the end of each data collection period.

Cloud-based apps are also relatively easy to download, maintain and operate. However, in contrast to other apps, cloud-based apps maintain a connection to the full-featured software located on an off-site server thus allowing more robust capabilities and ability to customize. In our experience, an Apple iPad based app, *Cloud On*, gave the most satisfactory results. We used *Cloud On* to access a standard Microsoft Excel spreadsheet, which was then saved to Dropbox, a cloud-based online file storage site. Several people could access the spreadsheet at once, so observers at different locations, using different input devices, could add data simultaneously to the same spreadsheet.

2.2. Recommended mobile tools

We were very pleased with our mobile data collection solutions but we did find it was important to use the right app for each observation environment.

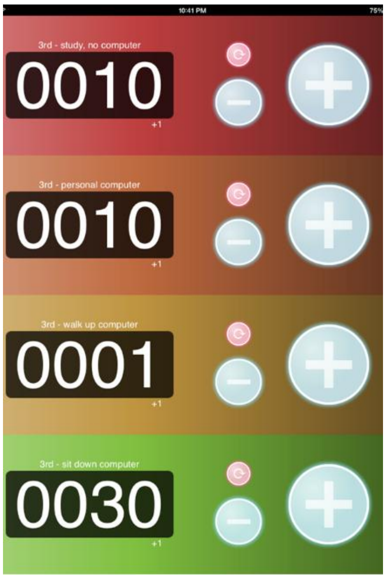
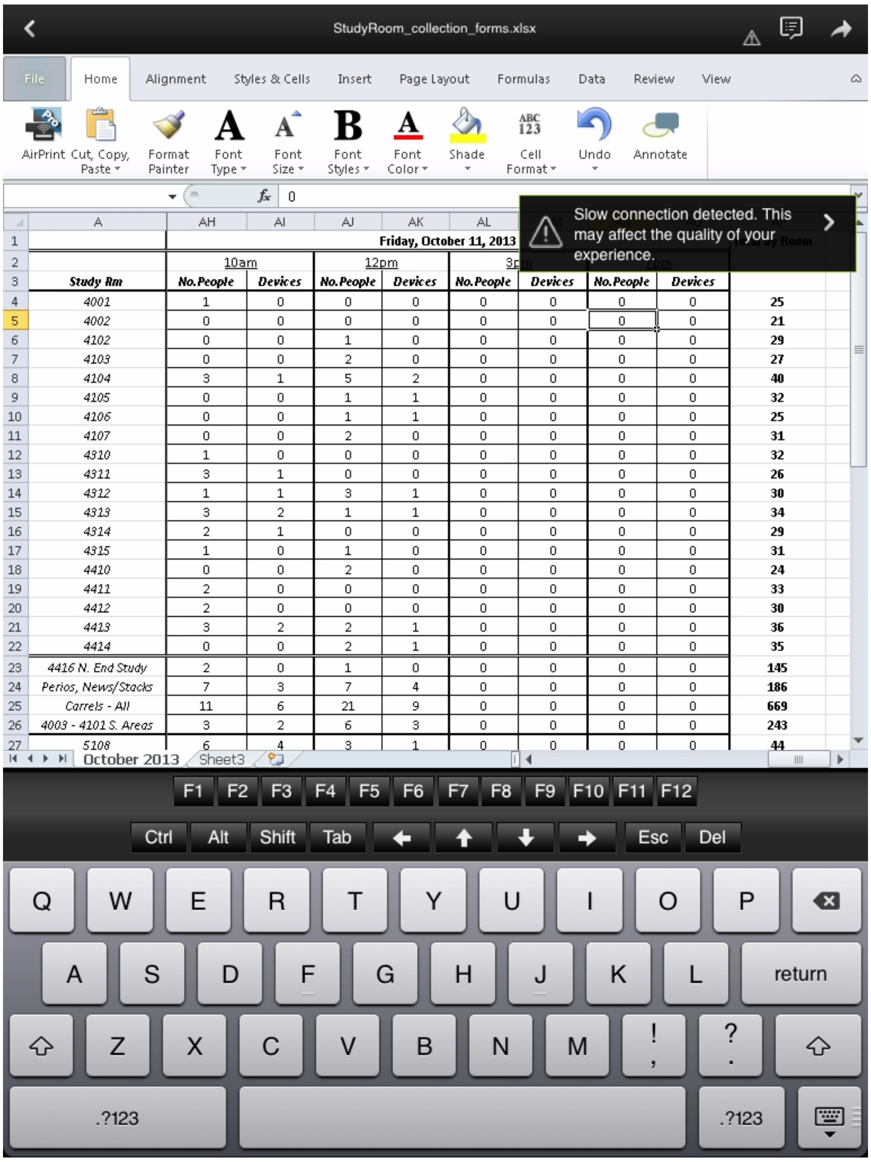


Figure 1 - Counter+

For example, *Counter+* was very effective for data collection in study spaces with a simple layout. Its eight counters were very easy to configure, and we could setup separate counters for several types of 3rd floor study areas including users in open study areas with no computer, users in open study areas with personal computers, and users in the computer lab (figure 1). The app worked well on both the iPad and iPhone; but, on an iPhone it was particularly lightweight and inconspicuous. Its ease-of-use made this our go-to app for spontaneous data gathering. But, with only eight counters, it was less effective in studying spaces with overlapping uses, or in tracking similar study areas on multiple floors. Aside from this, probably the biggest drawback was that the counts had to be emailed at the end of each observation time period to prevent the data from being overwritten. The counters then had to be zeroed before it was ready for the next count. This was particularly inconvenient when conducting repeat observations at different times of day.

For our study's purposes, *Cloud On* proved to be the more useful of the two apps. This was because it supported our use of a very detailed data collection spreadsheet. We created an Excel spreadsheet that enabled us to collect data on the five different study areas on each floor of the library: carrels, tables, computer workstations, casual sitting, and study rooms. Particularly important was describing use of each of the library's 40 study rooms by room number. For each study area, we counted the number of people and the number of portable computers in use. We were also able to track library use at four different times of the day and for each day of the sample week.



	A	AH	AI	AJ	AK	AL	AM	AN	AO	
1		Friday, October 11, 2013								
2		10am		12pm		3pm				
3	Study Rm	No.People	Devices	No.People	Devices	No.People	Devices	No.People	Devices	
4	4001	1	0	0	0	0	0	0	0	25
5	4002	0	0	0	0	0	0	0	0	21
6	4102	0	0	1	0	0	0	0	0	29
7	4103	0	0	2	0	0	0	0	0	27
8	4104	3	1	5	2	0	0	0	0	40
9	4105	0	0	1	1	0	0	0	0	32
10	4106	0	0	1	1	0	0	0	0	25
11	4107	0	0	2	0	0	0	0	0	31
12	4310	1	0	0	0	0	0	0	0	32
13	4311	3	1	0	0	0	0	0	0	26
14	4312	1	1	3	1	0	0	0	0	30
15	4313	3	2	1	1	0	0	0	0	34
16	4314	2	1	0	0	0	0	0	0	29
17	4315	1	0	1	0	0	0	0	0	31
18	4410	0	0	2	0	0	0	0	0	24
19	4411	2	0	0	0	0	0	0	0	33
20	4412	2	0	0	0	0	0	0	0	30
21	4413	3	2	2	1	0	0	0	0	36
22	4414	0	0	2	1	0	0	0	0	35
23	4416 N. End Study	2	0	1	0	0	0	0	0	145
24	Perios, News/Stacks	7	3	7	4	0	0	0	0	186
25	Carrels - All	11	6	21	9	0	0	0	0	669
26	4003 - 4101 S. Areas	3	2	6	3	0	0	0	0	243
27	5108	6	4	3	1	0	0	0	0	44

Figure 2 - Cloud On view of Excel data collection spreadsheet

First, we created the Excel spreadsheet using a desktop computer. The completed spreadsheet was then uploaded to Dropbox, which allowed multiple people to gather data and store it in the same spreadsheet. *Cloud On* completed the loop by connecting our iPad to the Excel spreadsheet in Dropbox. We were able to roam around the library, filling in the cells with our data, and have the data immediately saved and totaled, without the need for periodic emailing and clearing of registers. We could even add comments, and edit as needed, without extra effort.

Cloud On combined the strength of full-featured desktop application with the mobility and easy data entry of the iPad. Since we could make the Excel spreadsheet as complex as we wished, data could be collected on multiple data points (figure 2). Because Cloud On could use all the features of the desktop application, we were able to use Excel shortcuts such as the ability to lock the view to simplify data collection. Last but not least, the fact data was automatically input into the final spreadsheet made it immediately available for analysis, creation of charts, etc.

The only persistent drawback to *Cloud On* was that, as a cloud-based technology, the app needed to connect to the internet every time new data was entered. If the connection to the internet was slow, for any reason, our ability to enter data was slowed as well. When the internet connection dropped out altogether, we were out of business until the connection was re-established, and we were, of course, only able to collect data in locations with wireless internet access—which did not include some of the more remote corners of our building. The warning box shown in Figure 2 sums up the problem: this did in fact affect the quality of our experience.

Because traditional desktop software is designed for use on full sized computer screens, not the small iPad screens that we were using, we found we had some difficulty constantly scrolling to the part of our spreadsheet that we needed to see. This problem was compounded by the fact that the spreadsheet would change size as new data was entered. However, this was a problem for us only initially. We were able to solve it by designing our spreadsheet to fit the smaller screen, and we were able to stop the constant size changes by prefilling all the data cells with zeroes. This had the added advantage of speeding data entry for library spaces with no users, since no additional data entry was needed.

3. Results

Mobile technology support did indeed prove to be an efficient method to gather data. Despite the quantity and complexity of the data collected, each observation period only took about 45 minutes to cover the four floors of the library's study space. This was the same amount of time it took to fill out an equivalent paper version of the Excel spreadsheet (some staff members did not have access to an iPad). Because the spreadsheet was in shared cloud-storage, it was simple to manually enter data into the same spreadsheet used with Cloud On so the data was always in sync. However, using the paper data entry form took additional time to be transcribed into the online spreadsheet and introduced the potential for transcription errors.

Analysis of the study's data has given us a more complete picture of how students used the library's study facilities. A perennial concern by library staff is that the study rooms are actually used by groups as intended. Our study was able to show that during the sample week in October 2013 (based on four sample times throughout the day), 70% of the study room use was by groups. The percentage was even higher on Monday's and Wednesdays, two of the library's busiest days. We also found that personal computing devices were in use by study room users 90% of the time; and, by combining data on groups and technology usage, we were able to determine that, when groups of students use the study room, more than one student was using their personal technology device in 57% of cases.

We also compared our observation data with that collected by a conventional library application, namely our study room reservation system. The conventional reservation data had the advantage of being collected every day the library was open whereas our observation study was only collected during a small set of sample weeks and times of day. Nevertheless, the observation data provided important insight into the more traditional assessment method. For example, the reservation statistics showed 58% occupancy of the study rooms it tracked during the hours of the observation study, but the observation data using *Cloud On* showed usage of the same study rooms actually averaged 75% during the same study periods. Walk-in traffic—spontaneous use of the space by students who had not thought to make an advance reservation—clearly accounted for the 17% difference. This showed two things. The first, of course, was that our policy of allowing walk-in traffic for the reservable study rooms was clearly warranted. The second was that the use of our reservation system data to get a sense of space usage was clearly limited, or even misleading.

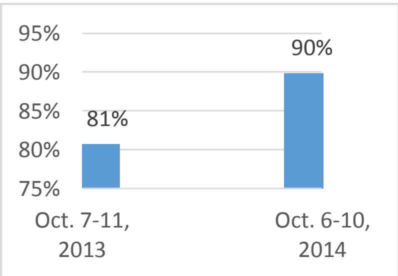


Figure 3 - Study room occupancy

Despite staff fears to the contrary, the study has been able to show that the quantity of users in the library actually increased after the new student union opened. Comparing data from October 2013, before both the increase in library hours and the completion of the University Student Union (USU), with data from October 2014, when both longer hours and the USU were in place, showed a 9% increase in study room use.

4. Conclusions

A test of our new method showed that using mobile devices, such as the iPad, facilitates data gathering throughout the library building. Using the right mobile applications enabled us to track our observations of patrons using a variety of criteria including area of the library building, type of study space, and types of student study behaviors. The resulting data could then be analyzed in a variety of ways such as by time, location, and types of behavior.

The test of the effectiveness of mobile technologies was, of course, a preliminary step in mounting a full study of library space usage. The CSUSM space study using *Cloud On* with the iPad was completed at the end of the 2014 fall semester after collecting 9 weeks of data between 2013 and 2014.

The full study confirmed the finding of our preliminary tests. We found mobile technology was easy to use and greatly simplified data collection. Use of mobile technology in the full study confirmed the value of using mobile technology to conduct observations of study area usage, rather than depending only on statistical reports that are by-products of library service applications or gate counts or manual data collection. The use of mobile devices with apps enabled us to study our users on a more personal, often spontaneous level. We found that developing simple methods for tracking library use increases the ease and likelihood that the library will carry out assessment of user behaviors around the library.

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