

Where do we go from here? Managing collection moves with data visualizations.

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Introduction

At the heart of every great university sits a great library. However, what makes a great library has been transformed by the digital revolution. On the one hand, almost all new scholarly content is available in electronic form, and on the other, teaching, learning, and research have become increasingly interactive and interdisciplinary, requiring new types of spaces and new technologies. Against this backdrop, academic library leaders are re-imagining their libraries. New library buildings at North Carolina State (<https://snohetta.com/projects/10-james-b-hunt-jr-library>) and Temple (<https://snohetta.com/projects/460-charles-library-at-temple-university>) are the most notable examples of this in the United States. Many other university libraries are undergoing extensive changes to their services and spaces by repurposing the existing buildings. Georgia Tech (<http://library.gatech.edu/library-next>), the University of Calgary (<https://asc.ucalgary.ca/building/mackimmie-library-tower/>) and the University of Virginia (<https://www.library.virginia.edu/renovation>) are just a few examples of recently re-designed library spaces.

In early 2016, the University Library System (ULS) at the University of Pittsburgh was given an opportunity to re-imagine spaces and services in its main location – Hillman Library. Initially, the university approved funding for extensive renovation of the library to address the aging infrastructure in the building, including asbestos abatement, HVAC replacement, lighting improvements, provide adequate electricity and WIFI supply, and reduce overcrowding. Apart from addressing desperately needed infrastructure improvements, Library management successfully argued for additional funding to better respond to the changing research and educational needs of its academic community.

In this paper, the authors will describe the tools developed to meet the challenge of relocating some 1.5 million physical collections housed in Hillman Library in order to free up space for new services.

Context

The University of Pittsburgh is a research-intensive institution with a population of 35,000 students, nearly a third of them in graduate and professional programs. Pitt researchers publish more than 9,000 peer reviewed publications per annum, with particular strength in the biomedical sciences. They are supported by 12 libraries, with a combined collection of nearly six million titles. Hillman Library, completed in 1967, serves as the main library for the university and is situated in the heart of the Oakland campus in Pittsburgh. It was designed to complement the architecture of the immediate area – Forbes Field, one-time home to the Pittsburgh Pirates, the modified renaissance style of the Carnegie Library of Pittsburgh, and the neo-gothic Cathedral of Learning – all iconic landmarks of the city. Hillman, like many other libraries of its era, prioritized the safe storage of books over reader comfort.

To help assess community needs and program the renovated building, the university retained brightspot strategy LLC. Spaces and services for creativity, collaboration, and active learning, and a showcase for community achievements all emerged as top priorities for the renovated building. For instance, we increased the footprint for user spaces by 60%, which provided for the creation of over 60 group study rooms, and by 40% for partner and specialized services such as media creation and maker spaces. (brightspot, 2016) In the redesigned building, each of the five floors would focus on different aspects of the vision. Lower floors would be dedicated to creativity and partnerships, housing maker spaces and labs, classrooms, recording

facilities and a café. Services housed on these floors would be run by the ULS exclusively or in partnership with other university entities such as the Center for Teaching and Learning, Computing Services or the Center for Creativity. Upper floors were designed for contemplative work and serious scholarship, with physical and digital displays for special collections and current research, dedicated graduate student spaces, meeting rooms, and the residue of the general collection.

To achieve these programming goals, we needed to reduce the footprint taken up by physical collections by 80%.

Method

In 2017, the Hillman collection move group was formed to address both the policy issues of what the general collection remaining in the building should include, and the practical aspects of the move. The group's work was informed by the following set of principles:

- The building will remain open to the public throughout the renovation.
- Disruptions to patron access will be kept to a minimum.
- Hillman's overall collections footprint will be reduced by no less than 80%.
- The collection's distribution of subjects and material types will reflect current and future Pitt scholarship needs.

- After the renovation, the size of the Hillman collections footprint will be managed over time by implementing a “steady-state, zero footprint growth”¹

It quickly became clear that to achieve these goals we needed more than just excel spreadsheets containing shelf lists and usage data. We needed a robust mechanism for analyzing this data in a timely manner to allow for rapid modeling of different scenarios to minimize patron disruption and maximize the efficiency of physical handling of the materials. Moreover, it was important that this modelling could be done easily by a wide range of colleagues involved in the project. Tableau visualization software proved to be an excellent mechanism for presenting data in a meaningful way and allow for rapid modelling.

Underlying technologies

In our case, to develop our tools, we used Tableau (Tableau Desktop to develop visualizations and Tableau Server to share them). Both tools are subscription based, and while the Desktop is fairly inexpensive with an academic license, the cost of the Server may be prohibitive for most library systems and becomes a practical option only with an existing university-wide subscription and technical support. The authors do not recommend using Tableau Public for collections modelling as that would require allowing your visualizations and underlying data to be exposed to anyone with internet access. Our choice of Tableau for this project was based on the availability of Tableau Server at the university, technical support from Pitt’s Business Intelligence unit, and the fact that we have been using Tableau already for

- ¹ Print collections across ULS have been growing at around 40,000 items per annum over the last three years.

analyzing and visualizing most of our library data. However, the tools we describe in this paper can be developed using a variety of software solutions, from Excel add-ins allowing for additional analytics and visualizations and MS Power BI to Oracle Analytic Server (available with Alma Analytics) and SAS Visual Analytics.

Wayfinder tool

When the preparation work for the renovation began in late 2016, we had less than one year to move approximately 45,000 LF of books and serials plus the entire microform and map collection to other floors in the main library, to another campus library and to remote storage. Emphasis was on identifying swing and remote storage space, as well as making sure that we had enough room to accommodate the contents of the collection-heavy 4th floor. Understandably, our focus was on moving material as quickly as possible, while keeping it accessible to our users. It quickly became clear that we needed to develop wayfinding tools that enabled staff and patrons to locate material that had moved. And we needed to refine the tools we used to identify which items would remain in the main library. This first year of the move helped illuminate how we might make key improvements to wayfinding for our patrons and library colleagues and develop an agile collection modelling tool. Our efforts concentrated on establishing tools that were accessible, adaptable and readily updated, used, and easily replicated. Each of these aspects will be discussed in detail in relation to each tool.

To make up-to-date information quickly accessible to our users and colleagues, we worked with our web services unit to implement two critical components on the library's website. We included a "What's moving?" section which indicated which collections were in

transit or soon to be moved, and this worked hand-in-hand with an interactive map. Since the interactive map is web-based, it is accessible to anyone with an internet connection.

We also wanted the ability to update the map as quickly as possible without requiring a lot of time and effort to develop new floorplans, graphics, signage and complicated website edits. We discovered that it was relatively easy to create a visualization in Tableau by using existing floorplan images and ‘mapping’ call number ranges and services to their respective location on the floorplan. Any movement of materials and services can be updated in a matter of minutes by using the “annotate” feature in Tableau to generate the precise coordinates to plug into the underlying data source. A nice feature with Tableau is that you can see how many times a visualization was viewed. This, along with anecdotal evidence from colleagues and users, showed people were using the tool and finding it helpful to locate the items they were seeking. Additionally, once we figured out how to create and implement the interactive map, it was simple to replicate it for other locations and needs. For example, we created another version for use with an iPad kiosk in Hillman Library. This version includes a “you are here” icon and the display is configured to best suit the iPad.

There is a great deal of flexibility in how to design and visualize interactive maps in Tableau. For example, the visualization may display multiple maps individually. For a time, we used this technique to show each floor independently when a location on that floor was selected. After experimenting with and updating different map layouts, we settled on using the single map, showing all floors at once. This made updates to the map much faster and easier, and users could easily see multiple collections in one view at one time.

To get started we needed: an image file (e.g., floorplan), and underlying data file (e.g. Excel spreadsheet) with the datapoints, filters and location coordinates we wished to display on the floorplan. Examples and screenshots are included below.

Image 1: Sample floorplan that we used as the background image for our interactive map.

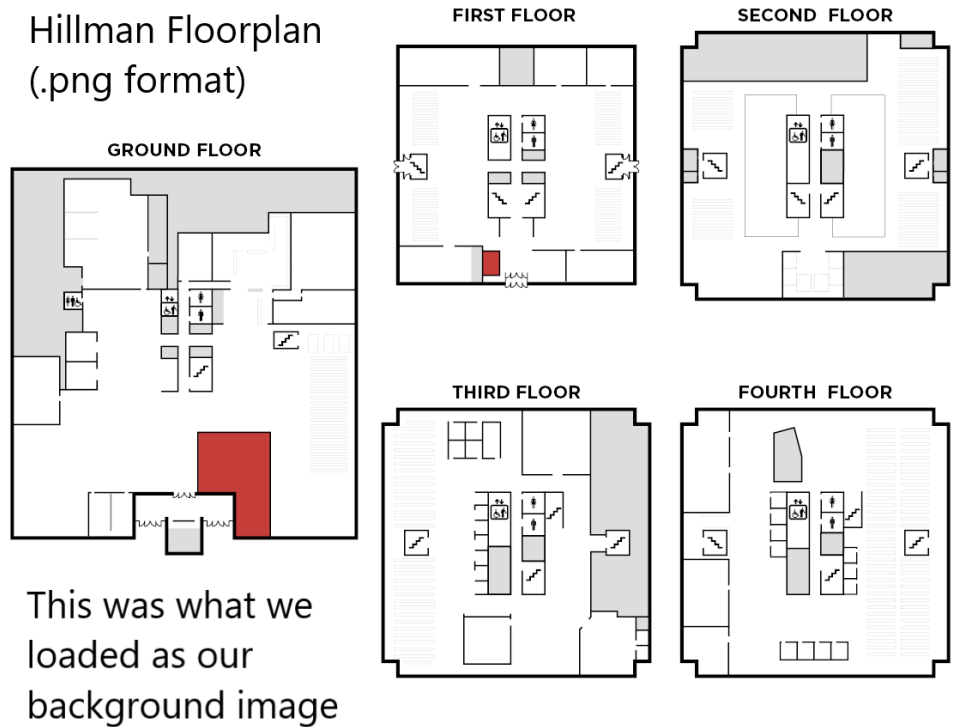


Image 2: Screenshot of spreadsheet data showing the sections we wished to display on the interactive map, and their type (service or collection to determine color of dot on the map). Data in the Number or Records column was used to define the size of the dots on the map, and the Floor1 data was needed when we used separate images for each floor (we no longer need this data, since we display all floors at one time on the same image).

Floor1	Number of Records	Section	TYPE
G		1 Stark Media Services	Services
G		1 Digital Scholarship Commons	Services
G		1 Cup&Chaucer Café	Services
G		1 Scanners/Copiers	Services
2		1 Administrative Services	Services
1		1 Computer Lab	Services
G		1 Microfilm reader	Services
G		1 Hillman Display	Collections
4		1 Chinese Reference & Journals	Collections
4		1 Chinese Books	Collections
4		1 Japanese Reference & Journals	Collections
4		1 Japanese Books	Collections
4		1 Korean Collection	Collections
3		1 P1-PA1 C94	Collections
G		1 Alldred Collection	Collections

sample of
underlying
data

Image 3: Screenshot of spreadsheet data that includes x / y coordinates for each section on the interactive map.

Section	X	Y
A - CT	43.014128728	7.655038760
D	95.952595937	15.782728050
E	91.663656885	13.275766017
F	91.776523702	10.838440111
G	92.453724605	8.261838440
H-HM	92.340857788	5.894150480
HN-HX	33.198645598	21.214484680
J	33.537246050	23.025069638
K - N	43.485086342	14.631782946
PA1 C95 - PZ	34.101580135	18.150417827
Q	17.739403454	44.864341085
R	17.739403454	44.864341085
S	17.739403454	44.864341085
T	17.739403454	44.864341085

sample of
x/y
coordinate
data

Initially, we did not have the precise location coordinates on the x / y axis and used Tableau itself to generate them. Using the ‘annotate’ feature, we could point to a location on the underlying image (floorplan) and see the exact x / y coordinates to plug into the data source for Tableau to reference. Additionally, we were able to manipulate the appearance of the location dots, using color to designate between collections and services, and standardize their size.

Screenshots showing how we used the annotate feature and edited the appearance of the view are included below:

Image 4: We created a second worksheet that showed the x / y axis and used the “annotate” feature in Tableau to click on a point and generate the coordinates which we then plugged into the worksheet that contained the x / y column values (see Image 3).

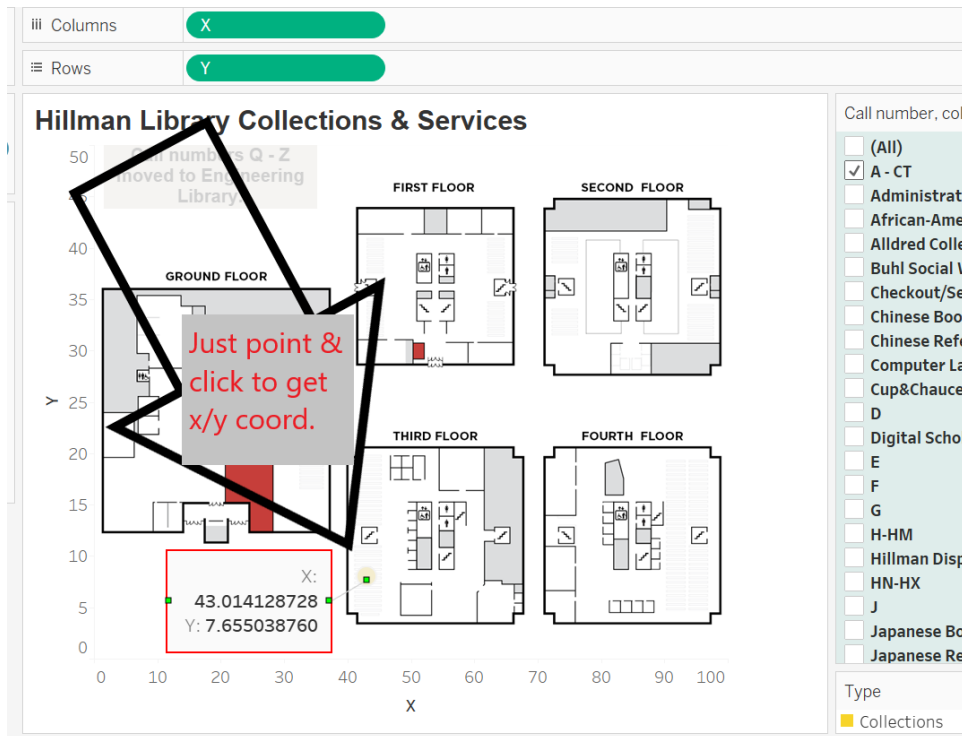


Image 5: This screenshot shows the Marks we used to define the color, size and shape of the dots, the filter used, and the positioning of the x / y fields as columns and rows on the background image.

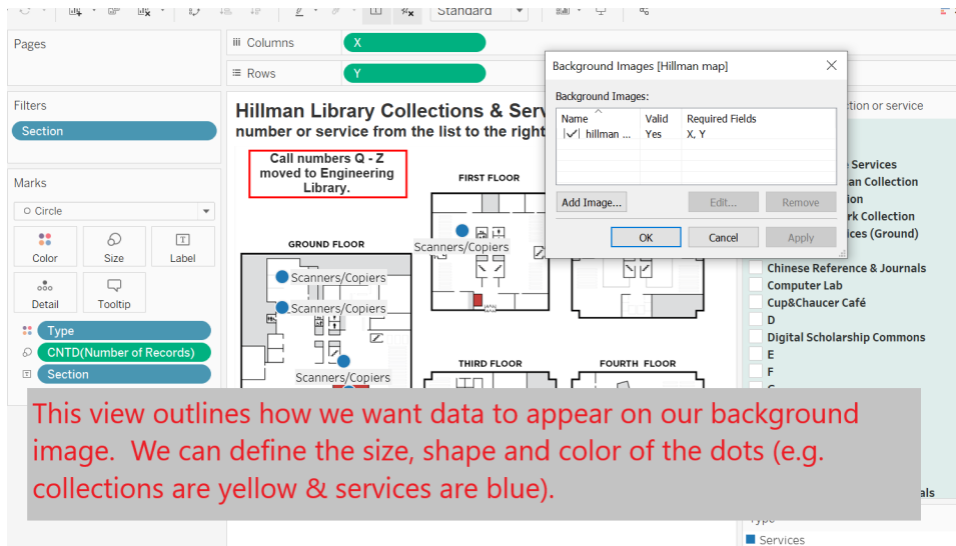
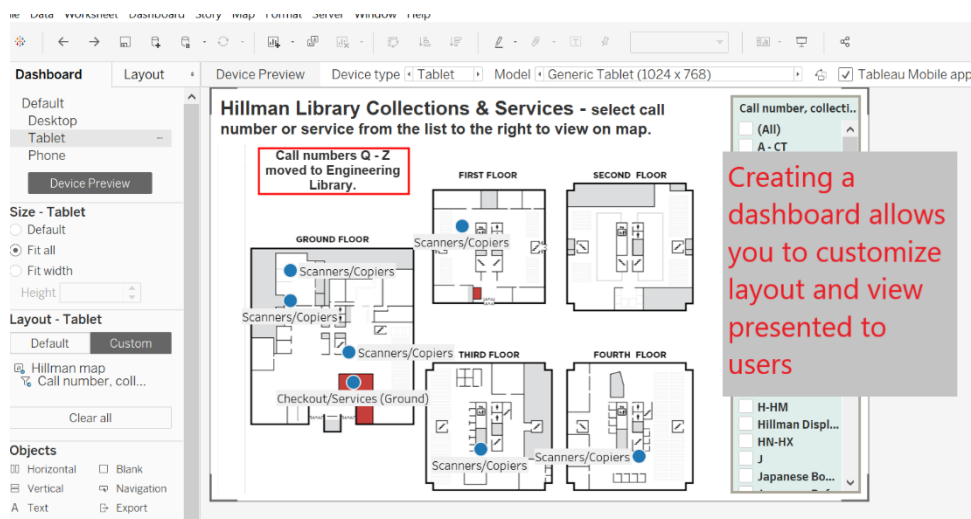


Image 6: To display the interactive map to our users, we created a dashboard and customized the layout for the filter and the default view.



To develop the interactive map visualization, we used Tableau Desktop. To make it available to users, we saved it to the University of Pittsburgh’s Tableau server, in the “public” folder which allowed any user with an internet connection to view and filter the map.

In general, Tableau provides very good support documentation that outlines step-by-step instructions for using background images, mapping points to the images and creating the x / y

coordinates, and displaying those points based on filters and user input. We supply links to this documentation in the references at the end of this paper.

Collection modelling tool

Next, we turned to streamlining our collection modelling. When we began the collection move, we were using Voyager as our ILS, and we developed criteria for what to send to Storage primarily based on the expertise of our Coordinator for Collection Development. When the initial criteria did not pull enough for storage, we had to go back to the drawing board, and incorporate additional selection criteria. Getting inventory information for large collections, such as that in the Hillman Library, required IT assistance to extract the data and lots of spreadsheet manipulation to apply criteria, create calculated fields and develop lists of items to transfer to Storage. The process was very cumbersome and time-consuming.

We turned to Tableau to help us make sense out of the spreadsheets and to create an interactive tool that would enable anyone with access to apply filters, and to sort and review titles to see the impact of different criteria on the existing collection. The visualizations enabled us to develop selection criteria, see if those criteria achieved the reduction in footprint needed, revise if needed, identify balance or imbalance of the collection, and do all of this before the actual move of material.

Based on the inventory reports, we created visualizations that calculated linear footage and provided a graphical representation of the collection make up (e.g., how much of the collection consisted of literature versus social sciences). Filters included: LC class, beginning publication date, historical charges, and when the item was last charged. Linear footage estimates were based on our observations and measurements, as well as the helpful table in the appendices

of *Moving Library Collections: A Management Handbook* by Elizabeth Habich. Additionally, we included views to show estimated linear footage footprints available based on the number of shelves and shelf capacity that would exist in the renovated space. Incorporating the inventory reports into Tableau also enabled us to generate pick lists directly from the worksheet/title lists. Once the views were developed, data could be refreshed as needed with extracts from Voyager. Since we recently migrated to Alma, we are working to develop methods to automatically update the data on a set schedule.

Data from Tableau shows this visualization tool is being used, by whom and when. Colleagues on other campuses recognized the tool’s potential and we have since developed additional collection modelling visualizations for use at other locations. We were able to easily replicate the basic model and included additional filters to meet the specific needs of the users; for example, we added filters to show if an item was part of a shared print repository agreement, or if an item was duplicated another location/campus.

Designing the collection modelling visualization in Tableau in many ways was more straightforward than the interactive map. Below is a table showing a selection of the fields that we used from Voyager and Alma to populate the underlying data source for Tableau.

Image 7: Sample of Voyager and Alma fields used in the data source for Tableau.

VOYAGER FIELDS	VOYAGER NOTES
ITEM_LOCATION	
NORMALIZED_CALL_NO	
DISPLAY_CALL_NO	
ITEM_ENUM	
CHRON	
YEAR	
COPY_NUMBER	

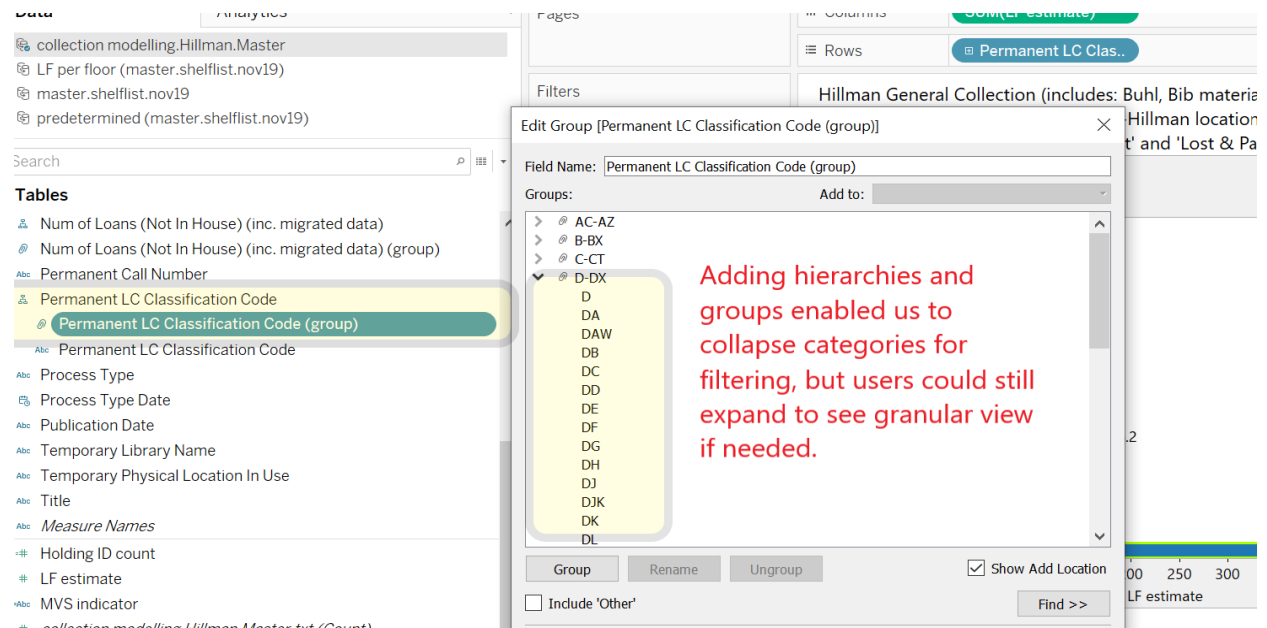
ITEM_BARCODE	
BEGIN_PUB_DATE	
TITLE_BRIEF	
AUTHOR	
EDITION	
HISTORICAL_CHARGES	
HISTORICAL_BROWSES	
LAST_CHARGED	
ITEM_STATUS_DESC	
ITEM_STATUS_DATE	
MFHD_LOCATION	
ITEM_ID	
MFHD_ID	
BIB_ID	
Multiholding	calculated field
Multivolume	calculated field
Never Circ 2010	calculated field
No Circ 2005	calculated field
Limited Circ 2005	calculated field
Multivolume Used	calculated field
Hold Multivolume	calculated field
Pull?	calculated field
COLLECTION TYPE	added field
EST LF	added field

ALMA FIELDS	ALMA NOTES
LOCATION NAME	
LOCATION CODE	
PERMANENT LC CLASSIFICATION CODE	
BARCODE	
NORMALIZED CALL NUMBER	
PERMANENT CALL NUMBER	
HOLDING LOCAL PARAM 01	contains voyager location code
HOLDING ID	
ITEM CREATION DATE	
LIFECYCLE	
PROCESS TYPE	
NUM OF LOANS (NOT IN HOUSE)	
LAST LOAN DATE	
TEMPORARY PHYSICAL LOCATION IN USE	
LF ESTIMATE	calculated field
ITEM MATERIAL TYPE	
BASE STATUS	

ITEM ID	
LAST LOAN DATE (NOT IN HOUSE)	
PROCESS TYPE DATE	
TITLE	
AUTHOR	
BEGIN PUBLICATION DATE	
PUBLICATION DATE	
BIB MATERIAL TYPE	
MMS ID	
TEMPORARY LIBRARY NAME	

We also include screenshots below of the visualization configuration which illustrate the different views and filters available to users and how we grouped some of the data so it could be expanded or collapsed based on need. For example, we created a hierarchy and group for the LC Classifications, so that users could expand or collapse subclasses for ease of viewing.

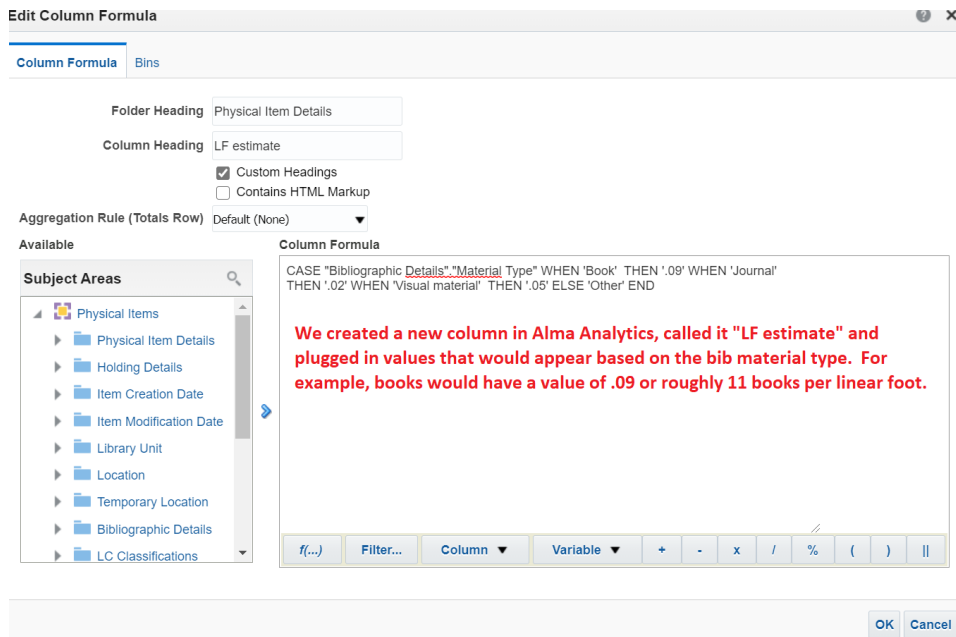
Image 8: Screenshot of grouping LC classification codes to streamline view.



Once we migrated to Alma, we were able to include a column in the Alma Analytics report that included a linear footage calculation. A screenshot of the formula and column

creation is shown below. Alternatively, the calculation could be done via a calculated field in Tableau, and there is a link to documentation to this in the references.

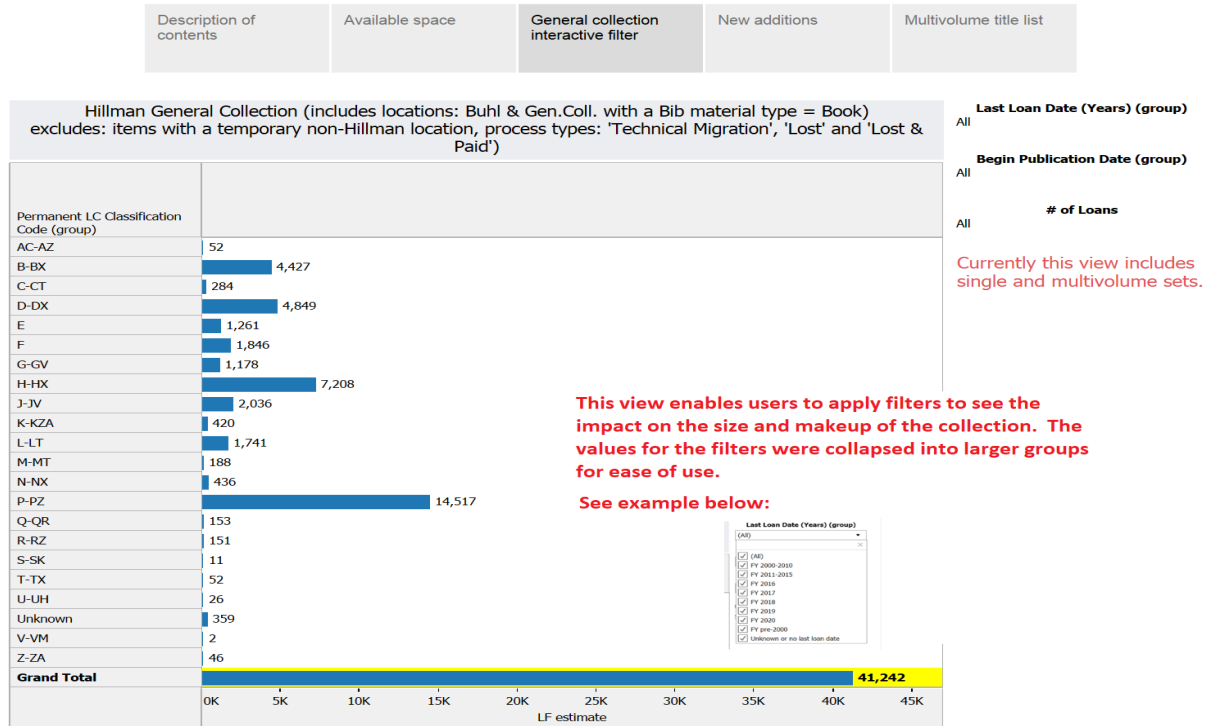
Image 9: Screenshot of calculated field for linear footage estimates



We created and utilized groups in Tableau to streamline filters for our users. This was particularly useful for the publication date, date of last loan, and number of loans fields, as the raw data provided hundreds of different values for each field. By grouping the values, we collapsed them into more meaningful and manageable sets by which to filter. The beauty of creating groups in Tableau is that once the initial setup work was completed, any new data would automatically be grouped appropriately in Tableau, unless a new value appeared that was not included in the initial grouping. These outliers were easily spotted, and groups were easily edited to incorporate them. There is a link to documentation on grouping data, included in the references.

Image 10: Screenshot of interactive visualization configuration

Hillman Library Collection - LF Estimator (estimates based on January Alma inventory)



One of the challenges to collection modelling was reviewing and applying criteria to individual monographs versus multivolume sets. As one can imagine, there were occasions when splitting volumes of a set between Storage and Hillman library was not ideal, for example with encyclopedia sets. We created separate visualizations of multivolume sets by adding a calculated field to identify holding ids with more than one item record attached. This calculated field could then be used as a filter and applied as needed.

Plans for Future Development and Practical Implications

Our interactive map is continually updated as collections move, and we foresee using this tool at other locations undergoing collection moves and renovation. We hope to use the collection modelling tool to identify topical or unique collections to feature in rotating spotlight shelving. Additionally, because of the reduced shelf space allocated to collections in the renovated library, we need to maintain a consistent collection footprint. We have begun to include data in the collection modelling tool that shows where we have added the most physical items over the previous year, to proactively identify sections that may be overcrowded and move items to storage to make room. To account for purchased items as well as items received via Gift & Exchange, we developed reports in Alma Analytics to filter for item creation date and limited to specific time frames, for example, the last 6 months. An example of the view is included below:

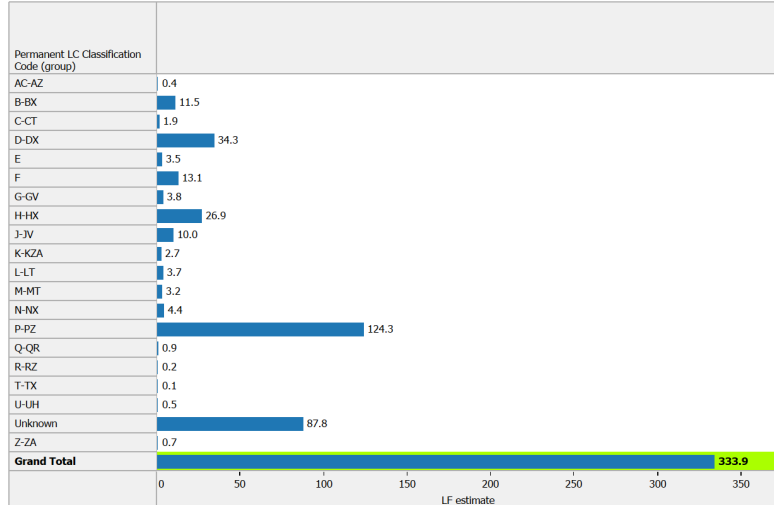
Image 11: Screenshot of recently added (recently created items)

Hillman Library Collection - LF Estimator (estimates based on January Alma inventory)

Description of contents	Available space	General collection interactive filter	New additions	Multivolume title list
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Hillman General Collection (includes locations: Buhl & Gen.Coll. only, Bib material type = Book)
 excludes: items with a temporary non-Hillman location, process types: 'Technical Migration', 'Lost' and 'Lost & Paid')

Item Creation Date
 9/1/2020 to 2/28/2021



'New adds' defined by item creation date. During migration many items were created in July 2020 that may not be true 'new adds'.

Lastly, we are working with Pitt IT to enable us to automate and auto-refresh data for the collection modelling tool on our institution's Tableau server. We are hoping to use Tableau's Web Data Connector to pull data from Alma Analytics into Tableau Server with scheduled data refreshes.

In conclusion, the authors believe that the development and implementation of tools described in this paper, though initially requiring substantial time investment in planning, implementation, and testing, proved to be worthwhile. The tools are used as intended (as proven by the usage data), and ultimately resulted in improved planning and implementation of the physical moves (for instance, understanding quickly how the selection criteria for the move to storage must be augmented to meet the reduction goals). Also, the ability to extend these tools to

other libraries at Pitt and their move projects, as well as their additional functionality to monitor growth of physical collections and react quickly, meets the authors' initial goals for this project.

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