

Title NRLF Capacity Optimization of Phase 1, Tier 1

Presented & Developed by Indy Nelson (November 24, 2015)

Description The project would be managed by Indy Nelson, with oversight of his supervisor. Since working in the facility, he has noticed many units of shelving have excess space above and below shelves, with much available space within the shelf itself. This has caused a loss in available space. The reason can be traced to when books originally were shelved. The setup of phase one, tier one, was approached with shelves being sized in uniformed proportion to the category book size (e.g. \$A, \$B, \$C, \$D). If the shelved books were proportionally less than the default category size, the difference would be equated to excess space. When facility team members initially shelved the collection, they refrained from resizing shelves, perhaps due to excess time required. With economies of scale, we can lower the time required to optimize these shelves.

Details The project would entail meticulous planning, team member training, ordering materials, determining parts of the collection to be relocated, optimizing each unit to determine if additional shelves are feasible; relocating the collection to the newly available space, recategorizing a small number of oversized items, labeling shelves, and creating a new illustrated map indicating the relocated parts of the collection. Each stage of the project would be transparent to all NRLF team members, with the approach of limited confusion, if any. Before a project stage is started, the project manager's supervisor would approve all details. Continuous progress updates would be provided within a digital project log (shared Dropbox folder) of all details, complications, and team member hours.

Process Capacity optimization is determined within the boundaries of a singular unit inside of a row. Phase 1, Tier 1, has a total of 104 rows. Each row approximately has 15 units (1,560 total). Each unit approximately has 7 shelves (10,920 total). There are two opportunities of optimization. **First** is optimizing the height between shelves by minimizing the excess overarching space above the shelved books. This will involve determining available excess space between shelves, and moving shelves up to optimize space, creating new shelves. **Second** is optimizing the depth of the shelf through adding a third row of books within a shelf. This process consolidates the below shelf back row to the current shelf's front row. If the current shelf doesn't have enough space for this new shelf, then a reallocated "B" or

“D” row will be placed. This will maximize the time allocation in optimizing the space by reallocating books to the newly available space.

Reallocating Sized D and B of the collection will be relocated within phase 1, tier 1, while size A will be reallocated to the available space within phase 3 tier 1. A total of 187,147 books will be relocated. These comprise of the following 156,834 of size B (\$B 325, 000 => 481,820); 25,834 of size D (\$D 49,322 => 75,820); and 4,493 of size A (\$A 1 => 4,493). By focusing on relocated books within phase 1, tier 1, time is saved from traveling from a different phase and tier, in addition to the travel time of reshelving new materials to be added to our collection in future. Size C books will be optimized with by adding a D or B size row in front, or adding a D or B size shelve (through height space optimization). Additional shelf space from new shelves will reallocate either D or B size books. The specifics of each stage are outlined within this proposal.

Stage One Create *Master Optimization Log* illustrating a Phase 1, Tier 1 layout including all rows and shelves (needed for completing pre-screening estimation). In addition, create the digital project log, and share the folder on Dropbox. **Project Manager**

Stage Two Pre-screening shelves within units within rows to determine estimated additional capacity of B and D size parts of the collection. This stage requires a shelf-measuring instrument to be created. Calculate the total number of additional shelves for “D” and “B” size collection pieces. Data also includes location of these shelves, noted on the master optimization log. **Project Manager**

Stage Three Present master optimization log with totals, details for the proposed relocation of collection items, and request for materials to be order. **Project Manager**

Stage Four Determine & hire project team members, create team member work-logs. Includes training od team members. **Project Manager**

Stage Five Relocate collection pieces to transit trucks (1 through 40) for sizes B and D. Each truck is labeled with two numbers, separated by 20 numbers (E.g truck 1, 21; 2, 22). The reason, is the two-member team would work with 20-trucks at a time of each size (40 total trucks). When books from trucks are relocated, these trucks become empty, waiting for the team to refill them. The truck, when added with relocated books, would then use the second number (if 1 before, 21 now) to lower confusion

of the team relocating the books to shelves. When the truck, labeled 21, is relocated, the truck goes back to truck number 1. Each truck will have a cardboard lot holder on the front, with reversible numbers, so relabeling the number of the truck is easy and efficient. Overall, this step would involve relocating all 4,493 A size pieces, moving 156,834 of size B and 25,834 of size D. These trucks are housed in “staging area” within phase 1, tier 1. Lastly, only the first level of the truck will include books, saving time for the reallocating team. **Two Member Team**

Stage Six The shift starts with preparation. This involves setting up the work area. Optimizing will start with B 1. The team will first determine if there is value in height or third row shelving only within that unit. No pieces will be moved from the following unit within this unit. If value is presented, the team begins with the following process:

- **Team Member One** begins by stating, "Row two begins" or as such to the second team member. He then places books on the optimizer. There is a metal block on the shelf to hold books in place.
- **Team Member Two** is responsible for replacing books that are too large for the shelf with a smaller book. This is if a book is deemed to exceed the height of a potential new shelf, it's replaced with a different book. Once determined, a rubber band is placed on both books, to be relabeled at a future time. The member also determines the size of the replaced book, and placing a rubber band around these two titles. These two will then be added to a truck for a future stage to relabel the titles and place the new title on the shelf. There will be a truck with new books, needing a label, which the member will use to gather new books to replace the old book. he member is also responsible for noting in the master optimization log, relabeling the shelves, and bringing up relocated trucks. Each shelf is meant to maximize storage with up to three rows of books on one shelf and lowering shelf height. If a third row is able, a relocated row of titles will be placed. To save time, none of the books originally on that shelf will be verified, except for the first and last pieces (to make sure the rows are correctly followed in numerical order). All books being relocated will be verified before they enter the shelf. The reason for this is determining NOS. An estimated space is required for the missing item. When the missing item is resheveled in the future by access services, if there was not enough space allocated, or the newly optimized shelf does not allow for enough space between shelves, that book will be relabeled, but only at that time. To the side of the staging area, there is a truck that is labeled with B and D size books without barcodes, used for this process.

- Within this stage, is adding of new shelves. Following the master optimization log, a new shelf is added to each row that is indicated. **Two-Member Team**

Stage Seven This stage involves three processes. **One-Member Team (three phases)**

1. **First** is going through each of the rubber banded items. The current labeled book will be stripped of the label. That book will go to deposit services to be relabeled in the future. The relabeled item will then be put on a truck to be shelved.
2. **Second** is shelving the relabeled books.
3. **Third** is verifying the relabeled books

Stage Eight Project manager does a final inspection for each completed row. This is noted in the master optimization log. **Project Manager**

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Stage Eleven Project Manager provides final report of the project with following inspected and completed (New facility location map, labeled units and rows, and master optimization log with statistics of the project). **Project Manager**

Direct Labor Requirements

1. Relocating team (Two Team Members)
 - a. 182,668 books from B and D sizes. Estimated at each transport truck carries 60 books on the top shelf. This requires 3,045 trucks to be filled and moved. The estimated time of loading a truck requires the following (Preparation time included). **355.25 hours**
 - i. 3 minutes in loading the truck for one team member
 - ii. 2 minutes in moving two trucks at a time (per truck time)
 - iii. 2 minutes in bringing two empty trucks back (per truck time)
 - b. 4,493 size A books. Estimated at each transport truck carries 10 books on both shelves. This requires 449 trucks to be filled and moved. These trucks require two-person relocating, transporting to phase 3, tier 1, and relocating books to shelf. **97 hours**
 - i. 4 minutes in loading the truck (combined, two minutes per team member)
 - ii. 5 minutes in moving two trucks at a time (per truck time, total 8 minutes)
 - iii. 4 minutes in unloading the truck (combined two minutes per team member)

2. Optimization team (Two Team Members)
 - a. 936 units will be required to be optimized (60% of facility, as 40% are being reallocated). Each unit has seven shelves, and to be conservative, we estimate all books will need to be moved off, as each shelf will be optimized. If 80 books were on each shelf, and there were seven shelves, 560 books would need to be moved. We average 3 seconds per book (28 minutes). The moving of the shelves, and adding of one extra shelf, would take 30 seconds per shelf (4 minutes, including the installation of the new shelf). The reallocating and placing of books back on the shelf would take 3 seconds per book (28 minutes). Total time for the three employees on this unit would be 3 hours of work. **1,872 Hours.**
3. Relabeling (Three phases)
 - a. We estimate, 2% of books will be relabeled (3,653 books). Each book requires the time to enter the book into the computer, and replacing the label (40 books per hour). The time required to reshelv (60 books per hour) and verify (60 books per hour). Every piece requires 3.5 minutes of labor. **213 hours**
4. Project Manager **200 hours**

TOTAL DIRECT MATERIALS (\$21,690)

1. Additional Shelving (\$20/each with 946 needed = \$18,720)
2. Wood and materials for two optimization shelves & shelf height determination (\$150)
3. Cardboard for transport trucks (\$20)
4. Label Maker printer to MacBook with tape (\$1,200).
5. Movable Work Station Desk (for third member team) \$200
6. Side row plaques (\$10/each = \$1,400)

TOTAL DIRECT LABOR HOURS (3,019.71 * \$14.5 = \$43,786)

1. HR and other **50 hours**
2. Relocating team **452.25 hours**
3. Optimization team **1,872 hours**

4. Relabeling **213 hours**
 - Project Manager **200 hours**
 - Breaks (8.34% of time added) **232.46**
5. s (8.34% of time added) **232.46**

TOTAL PROJECT COST: \$65,476

Current Book Capacity: 787,248

Additional Capacity: 182,654

New Capacity: 969,902

23.2% Increase in Capacity

\$0.36 per additional book

Comparison

- The construction cost of a Harvard-model facility (56% of libraries follow this) has construction costs between \$3 and \$4 per book. In additional research, all figures provide an estimate range of \$3 to \$11 to store books. At a conservative, \$3/book, it would cost \$547,962 to build the required capacity as this project would offer at an 88% discount of \$65,476.

Recommendations

- Assign Indy Nelson as *Head of Project Optimization*
- I noticed the head of deposit services has a salary within the range of \$47,600 => \$65,000. As I would have staff, budget, and project responsibility, I would request a recommended compensation of \$20.00 per hour. That would be below the salary range floor of the head of deposit services, and above those working within the project. Assuming 200 project manager hours are required within the project, this pay raise would raise the project cost by \$1,100 to a total cost of \$80,494 or \$0.44 per book

\$A 4 423 -
\$A 4 443

\$B 469 787 -
\$B 474 120

\$C 220 090 -
\$C 222 259

\$D 72 162
to
\$D 72 807

\$A 4 412 -
\$A 4 422

\$B 466 192 -
\$B 469 786

\$C 217 768 -
\$C 220 089

\$D 71 523
to
\$D 72 161

103.1

