Getting the most from your Millennium data

Using Office to enhance Millennium's reporting capabilities

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Post pre-conference Preface

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Now nearly two weeks removed from our time together, I hope you've had the opportunity to try your hand at generating reports using your own data with some of the tools we talked about. Some of the methods discussed are not easy to work with at first, but, with some practice, you'll soon be deftly putting together your own impressive reports that you can proudly show off to others, summarizing your own data in ways you may have never thought possible. The workbook was written in such a way that you should be able to replicate the steps, function calls and formulas provided, substituting your own workbook, worksheet, and cell reference calls as needed.

Office 2003 users: Most, but not all, of the Excel tools we talked about are available to you (mostly via the "Data" menu). What's not? Advanced PivotTable formatting options, fancy conditional formatting tools (like the broad color range seen in the WAM "hour by date" formatting, though simpler options are available), and the context-specific menus for working with charts (you can customize, yes—but the means to do so are generally linked to context menus when chart elements are selected as opposed to being always available like they are in Excel 2007). Additionally, some of the wizards you will run (like those for PivotTables) will have a few more steps in them, Microsoft having consolidated several steps into one within Office 2007.

The materials below, except for a single closing parenthesis I missed in preparation, are identical to the materials received in class, even though we didn't cover all of them in our class session. You now have a clean digital copy of the workbook to write additional notes in, should you so desire.

Lastly, remember that I am always available to answer questions you may have. Feel free to contact me via e-mail or phone using the contact information on the workbook cover. When contacting me by e-mail, I request you include a meaningful subject line so that my overzealous spam filter doesn't decide to discard your message before I even know you sent it. I may not have all the answers (does anyone?), but I should be able to at least point you in the direction you need to go.

It was a pleasure meeting and working with all of you. Until we get to meet again, I wish you luck with your Millennium and Excel endeavors.

An introductory framework: Office 2007

The latest release of Microsoft's suite of worker productivity programs, Office 2007 radically changes the way in which tasks in these programs are performed. For those unfamiliar with the changes Office 2007 brought with it, we'll first establish a list of definitions that will be referred to throughout today's workshop.

The "File" menu common to so many Microsoft Windows applications has been replaced with the **Microsoft Office Button**, located in the upper left corner of the program window. Program options and recently-accessed files are also found here.

Other menus and toolbars have been replaced by the **ribbon** in most Office 2007 applications. To display any given section of the ribbon, click on the desired tab located just above the ribbon. Elements in each ribbon area are often placed in **groups**, with the group name appearing centered at the bottom of each group.

Here are the "Home" ribbons from both Word and Excel. Note how, despite the different nature of Word and Excel, groups on the "Home" ribbon tend to be similar across the programs.
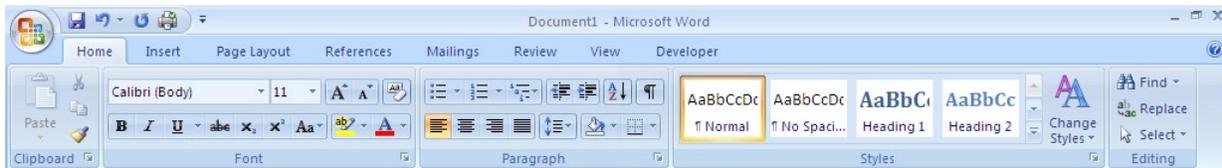
In the event there are more options for a group than are displayed in the ribbon, the lower right-hand corner of the group can be clicked on to open a dialog box, revealing all options for that group.

Some Office commands do not need to display unless you are working within a particular type of application element. These **contextual tool sets** will display only as needed and will add new tabs above the ribbon next to the tabs that are not context-specific. A heading, in a different color, will appear in the program's title bar identifying the specific context of the tabs beneath it.

Tables in Word generate two contextual tool sets, grouped together as "Table Tools". "Design" is shown below

Charts in Excel generate three contextual tool sets, collectively called "Chart Tools". "Design" is shown below.

An introductory framework: Excel

Just as with the new Office terminology, it is important that we're all speaking the same language when it comes to working in an expansive program such as Excel—even if that terminology is as old as the program itself! To that end, let's re-familiarize ourselves with some common Excel definitions. Other terms will be introduced throughout the workshop, but the list below is enough to get us started!

The files we work with in Excel are **workbooks** (just as Word files are properly called "documents"). You can have multiple workbooks open at a time.

Individual pages in an Excel workbook are called **worksheets.** By default, workbooks have 3 worksheets, though we can (and often do!) add and delete worksheets. You can only work on a single worksheet at a time in any given workbook. Any worksheet can be selected by clicking on its **worksheet tab** near the bottom of the Excel program window.

The **worksheet window** is the area of the worksheet currently displaying in Excel. Use the **vertical scroll bar** and the **horizontal scroll bar** to change what is displaying in the worksheet window.

Each rectangular box in a worksheet is a **cell.** A cell is the intersection of any given row and column and is always referred to by a combination of the column and row that comprise it, with the column listed first, *e.g.* A1. This is called a **cell reference** or **cell address**. On many occasions, we will want to refer to a range of cells. We use the format <cell reference>:<cell reference> to represent ranges, with the upper left-most and lower right-most cells of our range listed, *e.g.* A1:G5. Cell references can be more complex and can also include information related to the worksheet, the workbook, and its absolute path.

The cell in which you are currently working is the **active cell** and is reflected in the worksheet window with a black box around it. Though you may have several cells selected at any given point in time, only one cell is ever the active cell.

Cell references can be either **relative** or **absolute**. Relative references will change as cells containing them are pasted to other areas of the worksheet or workbook. Absolute references will remain fixed regardless of where they are pasted in a worksheet or workbook. Either or both of column or row can be absolute. Absolute references are indicated with dollar signs in front of the absolute element, *e.g.* A1 (both row and column absolute), $A1 (only column absolute), or A$1 (only row absolute).

All data in Excel is classified as either a **label** or a **value**. Labels contain any type of information not used in calculations. Humans use labels to make the data easier for us to understand. Values contain any type of numerical data, including numbers, percentages, and dates. Any cell that starts with a letter Excel will treat as a label. Labels are left-justified by default. Values are right justified by default.

The **formula bar** is one area where we can enter data into the active cell. While any given cell will display the completed calculation, the formula bar will always display any formula (or functions invoked by the formula) entered to reach that value. **Formulas** are mathematical expressions you create. **Functions** are pre-defined formulas and are comprised of **arguments**, listed in parentheses, after the function call. All formulas start with the equals sign (=).

The **status bar** at the bottom of the Excel program window provides us with an overview of keyboard and program statuses and can provide us with quick and dirty summaries when ranges of cells are selected.

Enough with the terminology. Let's get started!

Creating detailed financial reports in Word

We can create a financial report for a group of funds in Millennium, print them to the "e-mail printer", and format it in Word for electronic storage and distribution. Reports can be generated in Millennium Acquisitions provided that the "Funds" mode has been enabled for your login within that module. Though it is possible to generate a report for an individual fund or for funds or hierarchies from the previous fiscal year, our efforts will instead focus on creating a report for a selected hierarchy from the current fiscal year.

To access this data, you must be authorized for function 086 (Fund Reports).

A.   Getting the report out of Millennium

Millennium Guide and Reference (*MGR*) #105529 tells us how to get the report out of the system. Before doing this, however, we need to set the "Standard Printer" in MilAcq to the e-mail printer:

Via the "File" menu's "Select Printer" option, set the "Standard Printer" to the e-mail printer, entering a completely formatted, valid e-mail address when prompted.

To capture the data:

In Millennium Acquisitions, *change the current mode to "Funds".*

From the "Hierarchies" folder in the "Funds" tree, select the sub-folder for the group of funds on which you want to report.

In the main work window, click on the "Report" tab.

Select the "Detail report" checkbox to create a complete report. You may also clear that checkbox and specify the number of levels you'd like the report to contain.

In the "Report Header" box, type a heading of your choosing, such as "Through October 2008 reconciliation".

Click the "Start" button. The fully formatted report will appear on the screen. You can adjust column widths as necessary to view the report on-screen, but it is not necessary to adjust them to get the printed version to format correctly.

Click on the "Print" icon in the upper right-hand side of the screen. The "Select Standard Printer" dialog box will appear.

Make sure the e-mail printer is selected, click "OK", then type/verify a fully-formatted e-mail address in the request box, clicking "OK" again.

B. Formatting and saving the report in Word

In your inbox, you will receive a message from your server. Once the e-mail has arrived (it should arrive fairly quickly), open it.

For the purposes of this workshop, the e-mail message is replicated in the file "DFR Mail from the Library.txt". *Open this file.* This would be the equivalent of opening the e-mail message generated by Millennium.

Start up Word. If a new blank document is not created, create one by clicking on the Microsoft Office Button, selecting "New" from the resulting menu, and then selecting "Blank document" from the available options. Click "Create" to finalize new document creation.

If the rulers for margin setting are not displayed, go to the "View" ribbon and select the checkbox for "Ruler" in the "Show/Hide" group.

Via the "Home" ribbon, "Styles" group, select an option with no paragraph spacing.

Select and copy the entire contents of "DFR Mail from the Library" using standard "Select All" (Ctrl-A) and "Copy" (Ctrl-C) Windows commands.

Paste (Ctrl-V) the just-copied contents into the blank Word document.

With the message contents now in Word, again select all text using Ctrl-A.

Through any means (such as the right-click context menu), set the font to a fixed-width font (such as "Courier New") to allow for proper alignment of dollar amounts and other column-based data. Similarly, set font size Adjust left and right margins, as appropriate, so that all of the information for any given fund will appear on a single line. This can be done via the "Page Layout" ribbon, "Page Setup" group, "Margin".

Re-create the page breaks as presented in the original document. Look for lines that start with the library name as stored on your server, such as "Kresge Business Administration Library" within the file you're working on. Place a manual page break (Ctrl-Enter) immediately above these lines.

The report is now ready to be saved. You may find it helpful to make this final document read-only to prevent (or, at least, heavily discourage) changes from being made to it. To do this:

Click on the Microsoft Office button and select "Save As".

In the "Save As" dialog box, click on "Tools", then select "General Options".

Minimally, select the "Read-only recommended" checkbox, or also type in text in the "Password to modify" text box, re-entering the text when prompted to confirm the password. Stronger methods of protection such as encryption are available via the "Prepare" option from the Microsoft Office Button.

The next page contains a snippet of the report we've generated.

ALL ACCOUNTS : ACCOUNTING REPORT   -- FY 2007 final report 8/3/07 JES

		Appropriation	Expenditure	Encumbrance	Free Balance	Cash Balance	%
ALL ACCOUNTS							
MATERIALS ACCOUNT							
BOOKS							
Accounting/bks		$4,110.00	$603.40	$476.74	$3,029.86	$3,506.60	26%
Bus econ/bks		$5,351.00	$2,551.79	$1,384.84	$1,414.37	$2,799.21	74%
Career res/bks		$1,550.00	$59.81	$176.24	$1,313.95	$1,490.19	15%
CIS/bks		$3,866.00	$1,369.35	$511.71	$1,984.94	$2,496.65	49%
Communication/bks		$1,485.00	$199.19	$98.07	$1,187.74	$1,285.81	20%
Corp strat/bks		$9,368.00	$3,447.97	$770.49	$5,149.54	$5,920.03	45%
Environment/bks		$2,825.00	$1,526.59	$958.85	$339.56	$1,298.41	88%
Finance/bks		$9,472.00	$3,393.86	$979.07	$5,099.07	$6,078.14	46%
Gen business/bks		$10,998.00	$6,873.53	$2,459.21	$1,665.26	$4,124.47	85%
Bus hist/bks		$2,335.00	$29.92	$172.56	$2,132.52	$2,305.08	9%
Human res mgt/bks		$5,769.00	$2,224.52	$1,338.61	$2,205.87	$3,544.48	62%
Intl business/bks		$8,988.00	$1,329.66	$1,291.24	$6,367.10	$7,658.34	29%
Industry/bks		$3,103.00	$3,298.32	$2,674.79	-$2,870.11	-$195.32	192%
Insurance/bks		$618.00	$0.00	$0.00	$618.00	$618.00	0%
Bus law/bks		$2,563.00	$668.44	$563.52	$1,331.04	$1,894.56	48%
Marketing/bks		$6,362.00	$2,066.51	$2,123.37	$2,172.12	$4,295.49	66%
Operation mgt/bks		$3,555.00	$1,563.59	$1,622.76	$368.65	$1,991.41	90%
Professional/bks		$10,017.00	$334.06	$157.00	$9,525.94	$9,682.94	5%
Real estate/bks		$3,959.00	$1,253.18	-$272.70	$2,978.52	$2,705.82	25%
Replacements/bks		$0.00	$0.00	$1,829.00	-$1,829.00	$0.00	**%
Stat mgt sci/bks		$2,998.00	$0.00	$328.20	$2,669.80	$2,998.00	11%
BOOKS	Total	$99,292.00	$32,793.69	$19,643.57	$46,854.74	$66,498.31	53%
PERIODICALS							
Accounting/per		$16,256.00	$10,220.36	$6,035.64	$0.00	$6,035.64	100%
Bus econ/per		$12,806.00	$9,693.23	$3,203.77	-$91.00	$3,112.77	101%
Career res/per		$339.00	$595.49	-$256.49	$0.00	-$256.49	100%
CIS/per		$8,292.00	$6,111.44	$2,180.56	$0.00	$2,180.56	100%
Communication/per		$5,950.00	$805.42	$5,144.58	$0.00	$5,144.58	100%
Corp strat/per		$10,439.00	$6,195.12	$4,243.88	$0.00	$4,243.88	100%
Environment/per		$449.00	$949.73	$92.66	-$593.39	-$500.73	232%
Finance/per		$43,864.00	$27,874.79	$15,989.21	$0.00	$15,989.21	100%
Gen business/per		$17,542.00	$9,942.96	$5,577.15	$2,021.89	$7,599.04	88%
Bus hist/per		$707.00	$943.49	-$236.49	$0.00	-$236.49	100%
Human res mgt/per		$32,893.00	$9,500.12	$23,392.88	$0.00	$23,392.88	100%
Intl business/per		$19,345.00	$10,535.60	$8,809.40	$0.00	$8,809.40	100%
Industry/per		$7,357.00	$10,960.40	-$2,613.40	-$990.00	-$3,603.40	113%
Insurance/per		$2,100.00	$744.26	$1,355.74	$0.00	$1,355.74	100%
Bus law/per		$6,830.00	$6,152.00	$678.00	$0.00	$678.00	100%
Marketing/per		$21,291.00	$14,577.73	$6,981.05	-$267.78	$6,713.27	101%
Operation mgt/per		$4,457.00	$4,078.99	$378.01	$0.00	$378.01	100%
Professional/per		$1,323.00	$1,281.56	$41.44	$0.00	$41.44	100%
Real estate/per		$5,219.00	$3,546.09	$1,672.91	$0.00	$1,672.91	100%
Replacements/per		$0.00	$0.00	$0.00	$0.00	$0.00	**%
Stat mgt sci/per		$6,826.00	$6,129.55	$696.45	$0.00	$696.45	100%
PERIODICALS	Total	$224,285.00	$140,838.33	$83,366.95	$79.72	$83,446.67	100%
OTHER							
Accounting/other		$13,809.00	$10,853.37	$2,955.63	$0.00	$2,955.63	100%
Bus econ/other		$1,559.00	$4,142.76	$666.24	-$3,250.00	-$2,583.76	308%
Career res/other		$5,084.00	$1,932.25	$3,151.75	$0.00	$3,151.75	100%
CIS/other		$410.00	$135.93	$274.07	$0.00	$274.07	100%
Communication/other		$2,252.00	$1,660.00	$592.00	$0.00	$592.00	100%
Corp strat/other		$1,089.00	$623.02	$465.98	$0.00	$465.98	100%

Creating fund activity reports in Word

Just as we can create detailed financial reports in Word using financial reports sent to the e-mail printer, we can similarly create fund activity reports. It is possible for us to create a report for all funds or just a single one. Unlike financial reports, fund activity reporting is only available for the current fiscal year since only the current year has data in the payment history file, which is where the data is collected from. **Note that your site cannot be using "Simplified Acquisitions" to gather this data.** It is the action of posting that captures fund activity data and places it in the payment history file. Sites with Simplified Acquisitions do not have to post and therefore do not have a payment history file. Your site must utilize the traditional method of acquisitions (the one that requires posting) in order to generate this report.

Just as before, we need to ensure that the Standard Printer in Millennium is set to the e-mail printer. Unlike with financial reports, this detail is critically important here, for our ability to re-create the report is lost when the payment history file is cleared.

To access this data, you must be authorized for function 086 (Fund Reports).

A.   Getting the report out of Millennium

MGR #105490 instructs us on how to get fund activity data out of Millennium.

In Millennium Acquisitions*, enter "Funds" mode.*
.
Select the "Current Funds" subfolder (it should be selected by default).

Click on the "Activity" tab.

Enter meaningful text in the "Report Header" text box.

Make sure the "Show All" checkbox is selected.

Click on "Start".

Perform the required voucher number and encumbrance check. Click on "OK" to proceed.

With the report on screen, click "Print". The "Select Standard Printer" dialog box will appear. Make sure the e-mail printer is selected, click "OK", then type/verify a fully-formatted e-mail address in the request box, clicking "OK" again.

Note that, with more than a user-specified number fund codes, the report will split itself into several smaller pieces. Invoking "Print" will capture everything provided the "Show all" checkbox is selected. It is not necessary to print each smaller piece. Release 2007, under the "Funds" tab in "Settings" of Millennium Acquisitions", now allows you to set this number as high as 100.

The "Printing Complete" dialog box will appear. Do not select the "Printout is OK" checkbox until the e-mail has arrived and you've verified its contents are complete. If the printout is complete:

Select the checkbox next to "Printout is OK". Upon selecting the "Printout is OK" checkbox, the other checkbox allowing you to clear the payment history file is enabled. Clear the payment history file at your discretion.

The Kresge Library generates a fund activity report for all funds monthly at the time of the reconciliation of the previous month. The payment history file is also cleared at this time, regardless of size.

B. Formatting and saving the report in Word

In your inbox, you will receive a message from your server. Once the e-mail has arrived (it should arrive fairly quickly), open it.

For the purposes of this workshop, the e-mail message is replicated in the file "FAR Mail from the Library.txt". *Open this file.* This would be the equivalent of opening the e-mail message generated by Millennium.

Start up Word. If a new blank document is not created, create one by clicking on the Microsoft Office Button, selecting new from the resulting menu, and then selecting "Blank document" from the available options.

If the rulers for margin setting are not displayed, select the checkbox for "Ruler" in the "Show/Hide" area of the "View" ribbon.

Via the "Home" ribbon, "Styles" group, select an option with no paragraph spacing.

Select and copy the entire contents of "FAR Mail from the Library" using standard "Select All" and "Copy" Windows commands.

Paste the just-copied contents into Word.

With the message contents now in Word, select all text by again.

As with the detailed financial report, set the font to a fixed-width font to allow for proper alignment of dollar amounts and other column-based data. Set left and right margins and font size, as appropriate, so that all of the information for any given fund transaction will appear on a single line.

Optionally, re-create the page breaks as presented in the original document. Look for lines that start with the fund codes as listed on your server. Place a manual page break (Ctrl-Enter) immediately above these lines. Note that given the fact that information both immediately prior and immediately after any given page break is variable (i.e. changes from page to page), there is no way to automate this.

The report is now ready to be saved. You may find it helpful to make this final document read-only to prevent (or, at least, heavily discourage) changes from being made to it. To do this, refer to the steps in the previous exercise.

The next page shows a page from the report just generated.

The creation of these two reports ends our foray into data formatting with Word for this session. Why? Use of Word only allows to replicate or format existing reports our Millennium systems can provide. While this certainly has its place and is useful, we can do much more by extracting various data elements out of our systems and harness the power of spreadsheet applications such as Excel to generate reports on our terms. Much of the remainder of today's workshop will focus on that.

```
gen/b   Gen business/bks  FUND ACTIVITY REPORT, through 08/05 reconciliation
            PREVIOUS BALANCE =          APPROPRIATION EXPENDITURE ENCUMBRANCE
                    -$1,758.29                  $0.00     $340.69   $1,417.60
    CURRENT ACTIVITY - - - - - - - - - - - - - -
         PONUM    TITLE
 15921 1171550 Capabilities for strategic advantage : l      $0.00       $35.81
 15923 1171574 End of the line : the rise and fall of A      $0.00       $22.17
 15925 1171598 The essentials of negotiation                 $0.00       $34.06
 15926 1171604 Levers of organization design : how mana      $0.00       $29.84
 10996 1170247 Equity : why employee ownership is good      $23.45      -$23.45
 10996 1170259 Many unhappy returns : one man's quest t     $22.98      -$22.98
 10998 1170107 Becoming an effective leader                 $12.75      -$12.75
 10998 1170119 The essentials of finance and budgeting      $34.06      -$34.06
 10998 1170120 The essentials of managing change and tr     $34.06      -$34.06
 10998 1170132 The results-driven manager : managing ch     $12.75      -$12.75
 10998 1170144 Management dilemmas : when your strategy     $17.01      -$17.01
 10998 1170156 The workforce scorecard : managing human     $25.54      -$25.54
 10999 1168393 Mastering the merger : four critical dec     $29.84      -$35.00
 10999 1168563 Negotiation                                  $17.02      -$19.95
 11001 1170338 Made in China : what western managers ca     $29.84      -$29.84
 11001 117034x The results-driven manager : motivating      $12.75      -$12.75
 11002 1170405 The only sustainable edge : why business     $21.31      -$21.32
 11003 1170417 Harvard business review on managing proj     $17.01      -$17.01
 11003 1170430 The HR value proposition / Dave Ulrich,      $29.84      -$30.00
 11003 1170429 Harvard business essentials : time manag     $17.01      -$17.01
 11007 1171045 How to grow leaders : the seven key prin     $21.31      -$21.32
 11007 1171070 Thinking strategically in turbulent time     $59.64      -$59.64
 11008 1171008 Power, influence, and persuasion : sell      $17.01      -$17.01
 11009 1168496 When marketing becomes a minefield           $17.01      -$19.95
 11011 1170028 Never eat alone and other secrets to suc     $21.27      -$24.95
 11013 116871x Dictionary of international business ter     $12.75      -$14.95
 11013 1168952 The Routledge dictionary of business man     $19.57      -$22.95
 11022 1171197 Harvard business essentials : strategy :     $17.01      -$17.01
 11026 1169993 Nice girls don't get rich : 75 avoidable     $18.72      -$21.95
 11027 1171550 Capabilities for strategic advantage : l     $35.81      -$35.81
 11027 1171574 End of the line : the rise and fall of A     $22.17      -$22.17
 11028 1171598 The essentials of negotiation                $34.06      -$34.06
 11028 1171604 Levers of organization design : how mana     $29.84      -$29.84
 15947 1171847 Shaping the waves : a history of entrepr      $0.00       $34.06
 15952 1171872 Dealing with confidence : the constructi      $0.00       $37.80
                                               --------------- ----------- -----------
                SUBTOTAL =                             $0.00     $683.39    -$513.35
                                               --------------- ----------- -----------
CURRENT BAL =      -$1,928.33                         $0.00   $1,024.08     $904.25

6 new encumbrances listed above total $193.74, and average $32.29 each
29 payments listed above, average $23.56
30 payments made year-to-date average $34.13
```

Working with exported fund activity data

Earlier today, we talked about how to create detailed financial reports in Word. That, of course, was all fine and good, but there is one problem with that scenario: The report generated reflects *only* the current financial status of your funds. When any type of financial transaction is posted against your funds, the financial report also changes. What about your ability to collect a report prior to that posting? It's gone, and there's absolutely no way of getting it back (unless you happen to be Superman and can change the revolution of the earth to make time go backwards or have a time portal device at your disposal—if you fall under either of those scenarios, what are you doing working in a library, anyway)?

What about creating a report that covers just a certain time period? Provided you have financial reports for the exact beginning and exact ending moment that you want the report to cover, you can surely generate one—but not easily.   If you are creating such a report, you are most likely performing calculations and/or transcription manually, leading to the very real possibility that your report, no matter how well-intentioned, has errors in it.

Financial reports are just one aspect of this equation. Given the way in which Millennium order records are stored, it is impossible to see the entire history of posted transactions against an order record. Payments? Sure—all we need to do is examine the "Payments" tab of any order record. But what about changes made to encumbrance amounts? What about fund code changes? These changes are not reflected anywhere in the order record and can only be found by examining fund activity data or posting logs. If you're still printing your fund activity reports "the old fashioned way", good luck. It is very difficult, if not outright impossible, for you to get, with 100% accuracy, the history of transactions against any given order because the only way to identify transactions is to literally look through all of your reports and/or posting logs. Even using the methods outlined earlier today are of limited use to us because we'd need to search all of those files separately to find any given transaction against any given order record. Yes, the advent of desktop indexing systems such as Google Desktop help in our quest, but surely there must be more efficient ways.

What to do….what to do?

Until Release 2006, there was nothing you COULD do. We lived in a dark age, and our secret, fervent hope as keepers of this data was that nobody would ask us for this information because of the enormous difficulty it would take to provide it. That all changed when it became possible to export fund activity data from Millennium. We can run all manner of queries against this exported data and even use it to create reports.

First things first, though. Let's begin our discussion with…

A.   Getting the data out of Millennium

MGR #105490 describes the process used to export fund activity data. **Note that your site cannot be using "Simplified Acquisitions" to get this data.** It is the action of posting that captures fund activity data and places it in the payment history file. Sites with Simplified Acquisitions do not have to post and therefore do not have a payment history file. Your site must utilize the traditional method of acquisitions (the one that requires posting) in order to have access to this data.

You must be authorized for function 086 (Fund Reports) to access this data.

To export the data for all funds:

In Millennium Acquisitions, *Change the current mode to "Funds".*
.
Select the "Current Funds" subfolder (this should happen by default. If it doesn't, simply click on that folder in the "Funds" hierarchy).

Click on the "Activity" tab.

Click on "Export".

When prompted, select "Open in Excel".

The default display is not exactly pretty, but everything is there that needs to be. With only a slight amount of effort, you can get something that looks like this:

Open the file "FAR data.xlsx".

If you work routinely with fund activity data generation, you'll notices that there were a few things that *didn't* have to be done. Notice, firstly, that it was not necessary to select "Show all". Secondly, we didn't have to verify information in the "Activity Summary" dialog box. Thirdly, it was not necessary for us to click "Start" to get things, well, started, and finally, note that we were not given any sort of option to clear the payment history file.

While the instructions above enable us to export the fund data for all funds, it is also possible for us to select a *single* fund simply by selecting that one fund from within the "Current Funds" subfolder. As of Release 2007, it is NOT possible for us to select more than one (but less than all) funds, nor is it possible to use any of the hierarchical structures we impose on our fund codes—all manner of fund selection is restricted to the "Current Funds" subfolder and its contents.

What exactly gets exported? Simply put, the transactions that appears in exported fund activity data are those transactions that are currently residing in your system's payment history file. It mirrors exactly the transactions that would be printed if you generated a traditional fund activity report. When the payment history file is cleared, your ability to export any transaction that was in the payment history file is lost. It is thus possible for you to export the same transaction more than once, or not at all. To that end, you may want to standardize your library's procedures for exporting data, perhaps synchronizing this act with the clearing of the payment history file and keeping those workbooks of exported data as your master workbooks.

The data provided for each exported transaction is as follows:

Column	Data Element	Comments
A	Fund Code	Padded with trailing spaces as needed, to 5 characters
B	Fund Name	Full-length name of fund code
C	Date	Given only for "Exp" records or any action made via fund adjustment
D	Type	Values of Exp, Enc, Appro ONLY
E	Voucher/Encum# (*shortened to V/E #*)	Voucher or encumbrance number
F	Order Rec#	Number only, no .o. Includes checkdigit
G	Title	From first t-tagged field in bib record. 40-character limit.
H*	Appro	Amount of appropriation
I*	Exp	Amount of expenditure
J*	Enc	Amount of encumbrance

*H, I, and J are not mutually exclusive. An encumbered item being paid will reflect a negative encumbrance and a positive expenditure in the same transaction.

The Kresge Library manually adds another column which is labeled as "Report Date". This column lists the month and year of the reconciliation being performed at the time the transaction is exported. The Kresge Library exports this data once a month (at account reconciliation) and clears the payment history file at that time.

As it conveniently (and likely, intentionally) works out, our exported Millennium fund activity data is an outstanding example of what in Excel is called a well-formatted list. Well-formatted lists have the following characteristics:
- A **header row**, with each label in the header row being unique
- Each row is a complete entry into and of itself and is called a **record**
- Elements within each column are consistent from row to row. Any piece of information we're interested in sorting or analyzing is in its own column. Each column is called a **field**
- There are no completely empty rows (records) or columns (fields) in our data, though individual rows (records) may have empty cells in them
- The list occupies its own worksheet within our Excel workbook

Because our exported FAR data is well-formatted, we have a number of tools at our disposal for arrangement, identification, and analysis. These tools include:

- Sort
- Find
- AutoFilter
- Advanced Filter
- Pivot tables

Let's look at these tools and how they can help us!

Sort

Perhaps the one piece of Excel functionality everyone is familiar with is "Sort". Gone are the days where sorting lists of data was a proposition fraught with nervous hand-wringing because of the ease in which one could accidentally mangle the data. With just a modicum of precaution, Excel will quickly and properly identify the data you'd like to sort when invoking the Sort command.

Just as in earlier versions of Excel, Excel 2007's "Sort" takes on two flavors. A single click (and drag) on the "Sort & Filter" icon in the "Home" ribbon provides with a sort against the list based on the field the active cell is in. The right-click context menu also provides this feature. When invoking this "quicksort", Excel will guess based on the layout of the list whether or not it has a header row and acts accordingly. The default behavior can be overridden by invoking the "Custom Sort" option from the "Sort" dropdown.

The full version of "Sort" can be accessed using "Custom Sort". Here, you can specify up to 64 fields to sort by that can be easily rearranged. Previous versions of Excel limited you to three fields for sorting.

Exercise: Sorting

Let's sort our fund activity data by fund code, then by type, then by voucher/encumbrance number.

Place the active cell in the fund activity data.

*From the "Home" ribbon, the "Editing" group, click on "Sort & Filter", then select "Custom Sort" from the dropdown menu. **Or,** right-click any cell in the data to bring up a context menu, select "Sort", then select "Custom Sort". **Or,** go to the "Data" ribbon, in the "Sort & Filter" group, click on "Sort".*

Note the various ways in which this common Excel task can be performed. Note that Excel highlights the range of cells it will be sorting, and correctly identifies our data as having a header row.

In the "Sort" dialog box, make sure the "My data has headers" checkbox is selected (we know it to be; this is more to point out how to NOT set it if necessary)

For the first "Sort by" option, select "Fund Code", sorting on values, in the order A to Z.

Click on "Add Level" twice to add two more sorting levels.

In the second level, select "Type" from the dropdown, sorting on values, in the order A to Z.

In the third level, select "V/E #"from the dropdown, sorting on values, smallest to largest. Click "OK".

Voila! We have our sort. To see how our data is sorted at any point in time, we can simply re-invoke the "Custom Sort" dialog box, where all will be revealed to us. The biggest problem with "Sort": it's great for data arrangement but does nothing to assist us with record identification or analysis.

Perhaps for all of us, the sorting exercise was an academic one. But then again, I'm an academic, and every chance we have to explore the new interface Excel provides us is worth exploring!

Find

The next tool in our arsenal, "Find", allows you to identify records that meet criteria that you specify. Using "Find", you can:
- Specify one criterion per field
- Join criteria for different fields automatically with the Boolean operator AND
- Search using comparison operators

"Find" is useful for quick and dirty searching, but can be considered anachronistic because of the limitations it has. Even the programmers in Redmond have relegated "Find" to a secret status within Excel 2007, not placing it within the ribbon. It remains accessible only via the customizable Quick Access Toolbar or by invoking the Excel 2003 keyboard shortcuts (all of which have been transferred into Excel 2007 to allow those that used them to continue to use them).

Exercise: Find

We're interested in finding all transactions whose expenditure is greater than $1,000.00

Place the active cell in the fund activity data.

Use the following keyboard shortcut to invoke "Find":   Alt→ D → O

A dialog box will open. *Click on "Criteria".*

In this dialog box, in the "Exp" text area, enter both the comparison operator and the criterion, e.g. >1000.

Click on "Find Prev" and "Find Next" to scroll back and forth between matching records, which will display in the dialog box used to enter the criteria. Note that "Find Prev" and "Find Next" do not wrap when reaching either the very first or very last matching record.

The drawbacks to "Find" might be rather apparent:
- No provided number of matches
- Support for only one criterion per field
- No support for Boolean operator OR

Between "Sort" and "Find", we now have data arrangement and basic record identification covered, but our ability to perform analysis and aggregate record identification is still lacking. On to our next tool: "AutoFilter"!

AutoFilter

"AutoFilter" and commands associated with it provides us with our first real opportunity to perform data analysis. As with "Find", you specify fields to search and the criteria you would like to search by. Using "AutoFilter", you can:

- Specify up to two criteria per field, with the Boolean operator AND used to join criteria in *separate* fields together
- Combine criteria within the *same* field using the Boolean operators AND as well as OR
- Create "Top" and "Bottom" lists for both percentages as well as record counts

To invoke "AutoFilter" from the "Home" ribbon, "Editing" group, select "Sort & Filter" and click on "Filter" in the dropdown menu. **Or,** from the "Data" ribbon, "Sort & Filter" group, click on "Filter". With AutoFilter invoked, we'll then set our criteria for the fields we're interested in filtering by using the dropdown arrows that appear when AutoFilter is on. As the filter changes, records displaying through it will also change. It is essential to note that records not meeting filter criteria are simply **hidden from view;** they are **never deleted**.

When done filtering, AutoFilter is turned off in the same manner as it was turned on. To keep AutoFilter on but remove all current criteria (to again display all records), select the "Clear" option from within the "Sort & Filter" group or dropdown of the "Data" or "Home" ribbons.

Exercises: AutoFilter

Make the active cell a cell in the list.

Invoke "AutoFilter" using one of the methods described above. Note the presence of the dropdown arrows in the header row.

AutoFilter Exercise 1: Find all expenditures greater than $1,000.00 from the Library's classed serials ("/o") funds

Click on the dropdown arrow in the "Exp" header. Select "Number Filters" from the dropdown menu, then "Greater Than" from the submenu.

A dialog box will open. *Enter "1000" in the text box immediately to the right of "is greater than".* Note that the field, as well as the comparison operator, have already been set for you based on your previous actions. You need only type the criterion.

Hit Enter or click on "OK" to invoke this filter. Note the presence of a little funnel in the "Exp" field lable dropdown. This is your indication that this is a field being filtered against. Users familiar with "AutoFilter" from Excel 2003 will note that this is a MUCH easier way of viewing an invoked filter over the different colored arrow used in that version.

Now, click on the dropdown arrow in the "Fund Code" header. Select "Text Filters" from the dropdown menu, then "Ends With" from the submenu.

A dialog box will open as it did with the "Exp" filter. *Enter "/o" as prompted in the text box, again noting that the field and comparison operator have already been set for you.*

Hit Enter or click on "OK" to invoke this second filter.

Note the new funnel that has now appeared in the "Fund Code" dropdown. We are filtering by two fields simultaneously, with the Boolean operator AND joining these two criteria together. What elements comprise the filter? Mouseover the dropdown arrow for any filtered field to see specific details.

How many records meet our two filter criteria? 42 of our 2,639 records have an expenditure greater than $1,000 paid from a "/o" fund. How do we know this? We could count, but instead, look at the bottom left hand corner in the status bar of the Excel program window, which provides us everything we need to know regarding record counts.

AutoFilter Exercise 2: Find all expenditures between $1,000.00 and $5,000.00, regardless of fund

We'll approach this first by removing the "Fund Code" filter in place and modifying the "Exp" one.

Click on the "Fund Code" dropdown arrow and select the option "Clear Filter from 'Fund Code'". Note the little funnel is now gone, and we are again filtering only by "Exp".

Click on the dropdown arrow in the "Exp" header. Select "Number Filters" from the dropdown menu, then "Custom" from the submenu.

Our previous filter is still here, and we need not change it.

Make sure the Boolean operator radio button is set to "And" (it should be, by default)

In the second dropdown, select "is less than"

Enter "5000" in the text box across from it.

Hit Enter or click "OK" to invoke the new filter.

97 of our records have an expenditure of greater than $1,000 and less than $5,000.

AutoFilter Exercise 3: Find all expenditures between $1,000 and $5,000 from the "edb" fund

We'll keep our criteria from the second exercise in place here, re-adding one for "Fund Code".

Click on the "Fund Code" dropdown arrow.

In the list of values, clear the "Select All" checkbox. You may notice that the list of fund codes is not complete. Any fund code that does not already meet existing filter criteria is removed from this list. You can only pick from fund codes that are currently displaying through the filter.

Select the checkbox for "edb".

Hit Enter or click "OK" to invoke the new filter.

26 of our records have expenditures between $1,000 and $5,000 with a fund code of "edb".

AutoFilter Exercise 4: What are the top 1% of expenditures across all funds?

Let's start fresh with this example and display all records.

*From the "Data" ribbon, "Sort & Filter" group, click on "Clear". **Or,** from the "Home" ribbon, "Editing" group, click on "Sort & Filter" and select "Clear" from the dropdown menu.*

Note that "AutoFilter" is still on, but all filters have been removed.

Click on the dropdown arrow in the "Exp" header. Select "Number Filters" from the dropdown menu, then "Top 10…" from the submenu.

Select "Top" from the first dropdown, set the number in the second dropdown to 1, and select "Percent" from the third dropdown. Click "OK".

Having this list is great, but it's not sorted. Let's sort it so that the most expensive items are at the top. Starting with Excel 2003, you can invoke a sort from within a filter.

Click on the dropdown arrow in the "Exp" header. Select "Sort Largest to Smallest".

We now see our single largest expenditure was for $63,271.00 for "Executive Intelligence Service publications". Note that only the filtered records are sorted. Records not displaying through the filter are not sorted. When we turn off AutoFilter or otherwise elect to show all records, the sorted records retain their sorted placement among everything else which has NOT been sorted.

Sorting of this nature is good, but we'll want to do more with this information, of course. What if we were interested in determining what the top 1% of expenditures totaled? More generally, what if we're interested in any sort of numerical calculations on records displaying through a filter?

AutoFilter Exercise 5: What do these top 1% of expenditures total?

I know what you're thinking. You're thinking, "Oh GREAT. Here comes some long discourse on the SUM function, and he might even tell us about AutoSum. Yawn."

Your thoughts, however, would be incorrect. Why? Because the SUM function (and other functions in a similar vein like AVERAGE, COUNT, MAX, and MIN) acts upon all of the data in the range of selected cells, *including those suppressed from view via filters.* Surely Redmond programmers wouldn't leave us in a lurch like that, now would they? Would they? Seriously, now—WOULD THEY?

Of course not. The answer to this conundrum lies in the function SUBTOTAL, which we'll explore next.

A digression to introduce the SUBTOTAL function

The SUBTOTAL function in Excel acts only on records displaying through a filter. As the filter (and records displaying through the filter) changes, the value SUBTOTAL calculates will also change.

SUBTOTAL is invoked using the format SUBTOTAL(function_num, ref1, [ref2]…) and minimally requires two arguments.
- The first, a numeric value (*function_num*), represents the type of calculation you're interested in performing. Most-used arguments include "1" for AVERAGE, "2" for COUNT, "3" for MAX, "4" for MIN, and "9" for SUM, though there are others as well.
- The second argument and beyond (*ref1, [ref2]…*) consists of up to 29 cell references which you are interested in subtotaling. Cell references can be either individual cells or ranges of cells formatted using regular Excel syntax.

In order for us to see what these top 1% of expenditures total, we'll want to make the following function call. Though we could place it anywhere, for sake of convenience, we'll place it two rows after the end of our list data and in the same column as the expenditures themselves (column I).

In cell I2642, enter the following formula (which calls on the SUBTOTAL function)

=SUBTOTAL(9,I2:I2640).

Even though not all of the records are displaying, we still want to account for all of them in case we change our filter. This is why the ending cell in our range of cells is set to I2640—since this is the last record in our dataset.

Note in particular what happens as you start to type SUBTOTAL. Excel recognizes that you're typing a function name and kindly allows you to select it from a dropdown, continually narrowing choices as you type. To select any given suggestion, use the cursor keys to navigate down to it and hit the Tab key (NOT ENTER) to enter arguments. As you get to each argument within the function call, Excel keeps track of where you are in function construction and gives you hints as to what values are valid or what it is expecting for the argument. Very handy, indeed! Just as handy as having the *OCLC Bibliographic Standards and Formats* online!

After you complete the function call, hit Enter. Our top 1% of expenditures totals $493,989.24.

We'll use SUBTOTAL some more in just a little bit. For now, though, let's return our attention to "AutoFilter" by wrapping up the discussion.

"AutoFilter" is good and may provide us with most of the filtering power we need. AutoFilter still has some limitations, however:
- Support for only two criteria per field
- No support for the Boolean operator OR to join separate fields together

Our last filtering tool, "Advanced Filter", removes the last of these limitations.

Now finished with "AutoFilter", let's turn it off.

*From the "Home" ribbon, "Editing" group , select "Sort & Filter" and click on "Filter" in the dropdown menu. **Or,** from the "Data" ribbon, "Sort & Filter" group, click on "Filter"..*

Scroll down to I2642 and observe the effect on our SUBTOTAL function call.

Advanced Filter

Sometimes, the tools of "AutoFilter" are not enough—especially if we are interested in "OR"ing together two criteria from different fields, or if we're interested in specifying three or more criteria for any given field. "Advanced Filter" takes the last of our filtering restrictions and removes them, giving us virtually limitless filtering power.

Using "Advanced Filter", you can:
- Specify two or more fields to be joined in filtering via the Boolean operator OR
- Specify three or more criteria for any given field
- Filter the results into another area of the current worksheet (This is important later on)

Unlike "AutoFilter", which is available from both "Home" and "Data" ribbons, "Advanced Filter" can only be called from the "Data" ribbon.

Before invoking "Advanced Filter", however, we need to construct a table that will tell Excel how we want to filter our records. In this table:
- We'll specify the fields we want to filter by using their header row names, one per column, with the ability to use the same field more than once. Specified field names are cASe InSeNsItiVE
- Under each field typed in the first row of this table, we include both the comparison operator as well as the criterion. Put all criteria that are to be ANDed together in the same row
- Use additional rows as necessary. Criteria in different rows will be ORed together when "Advanced Filter" is invoked

When "Advanced Filter" is selected, we specify where the data is that we want to filter, as well as where the criteria table is. We can also select whether we want to filter the list in place, or place the filtered results elsewhere on the same worksheet. If the latter is elected, we specify the upper left-most cell for this placement, where the filtered records, including a new copy of the header row, will be placed.

Advanced Filter Exercise: Find all expenditures from both "edb" and all "/o" funds between $1,000 and $5,000

First, let's construct our criteria table:

Insert 5 blank rows at the top of the worksheet containing the FAR data.

In row 1, cells B through D, type the following three labels (one per cell):
fund code   exp   exp

In row 2, cells B through D, type the following three criteria:
edb   >1000   <1000

If we were to invoke "Advanced Filter" right now, it would display all records with an "edb" fund code that had expenditures of greater than $1,000 but less than $5,000, since all three criteria are on the same row and thus ANDed together by "Advanced Filter".

In row 3, cell B, type the following criterion:
*/o

The asterisk, as you might expect, serves as a wildcard. It doesn't matter what comes before "/o", or even how long it is. The filter will allow to pass through it any fund code ending with a "/o".
If we were to invoke "Advanced Filter" right now using both rows 2 and 3, it would display all records with an "edb" fund code that had expenditures of greater than $1,000 but less than $5,000. It would

ALSO pull in ALL "/o" records, regardless of amount. This is proper and the way that Boolean logic is supposed to work. Why? Because we've not put any "exp" limits on "/o" transactions—there are no "exp" criteria to AND together with the fund code criterion. If you're familiar with the way the INNOPAC ran its "Create Lists" function, you know what we need to do here. We need to re-specify our expenditure criteria in this new row:

In row 3, cells C through D, type the following
>1000   <5000

Our table now complete, it should appear as shown below

	A	B	C	D	E	F	
1		fund code	exp	exp			
2		edb	>1000	<5000			
3		*/o	>1000	<5000			
4							
5							
6	Fund Code	Fund Name	Date	Type	V/E#	Order Rec#	Titl
7	acc/b			Enc			En
8	be/b			Enc			En
9	car/b			Enc			En
10	cis/b			Enc			En

Time to invoke Advanced Filter:

Place the active cell somewhere in the list of records.

Go to the "Data" ribbon. In the "Sort & Filter" group, select "Advanced".

The "Advanced Filter" dialog box appears.

Keep the radio button "Filter the list, in place" selected for the "Action" area of the dialog box.

Because our active cell was in our list of records, Excel should properly guess that our "List range" is the range of cells A6:K2645. Note how Excel uses absolute references to refer to these cells.

For the "Criteria range", select either all of rows 1 through 3, or select the 9 cells (B1:D3) that make up the table proper. Click in the "Criteria range" text box to type the cell range, or, to select cells by clicking on them, click on the small cell selection graphic immediately adjacent to the "Criteria range" text box, select cells with the mouse, then hit Enter to accept the range.

Excel ignores cells with no contents when referencing the criteria table. This allows us to specify the rows in their entirety if we desire.

The "Advanced Filter" dialog box will appear as follows. One or both of the ranges may also include the worksheet name as part of the cell reference, as shown here

Click on "OK".

"Advanced Filter" is invoked. As with "AutoFilter", the number of records displaying through the filter displays in the Excel status bar—in this case, 65 records.

Scroll down to view cell I2647. (Note that this had been cell I2642 before we inserted the blank rows to create our "Advanced Filter" criteria table). *Observe the new value of $140,231.81, which is (still) the sum of expenditures for records displaying through the filter.*

More on SUBTOTAL

Let's use SUBTOTAL some more to get a count of records as well as the average of the expenditure amounts for our filtered data. For SUBTOTAL function calls, "2" is used for COUNT, and "1" is used for AVERAGE. Note the new range for the "ref" calls in the function, as our records have shifted downward because of our criteria table.

In cell I2648, enter =SUBTOTAL(2,I6:I2645). Note that this will display as $65.00 because of the accounting formatting forced across all of the column; this actually represents a count of 65 records (as verified by the Excel status bar).

In cell I2649, enter =SUBTOTAL(1,I6:I2645). The average of these expenditures is $2,157.41.

Could have we gotten this average just by doing a simple division of cell I2647 by I2648? Yes. But this was MUCH more fun.

Why are we constructing these numbers? Because they allow us to replicate the same calculations that appear on traditional fund activity reports! When we export the FAR data, that's all we get…the data. No "Previous balance" or "Current balance" and certainly no report or YTD statistics. We now have the tools to construct these numbers ourselves, with the added power of being able to construct them for any time period or across any other subset of transactions we want.

Display all records using one of the two methods of turning off filters.

Pivot Tables

So far, so good. Between filtering in its various forms and the practical application of SUBTOTAL to these filtered record sets, we can construct all manner of interesting financial statistics for others to ponder. We could while away the hours constructing these numbers, entertaining ourselves with our new-found wizardry until the cows come home (which they do, eventually—for food. I hear hungry cows get quite cross!)

But you'd discover that calculating these numbers, despite our fascination with them, can get mind-numbingly BORING. And, in order to really be able to do any sort of aggregated report, a certain level of transcription would become involved—a process potentially fraught with errors.

Wouldn't it be great if Excel provided us with a means of quickly summarizing data in some sort of tabular form? In the ideal scenario, we could easily adjust the rows and columns included, and could even specify what type of numeric analysis we were interested in?

The good news, of course, is that Excel DOES provide us with a tool like this. It's called a PivotTable (one of two subunits of the broader concept of PivotReports), and has been a valuable part of the Excel analysis arsenal since Excel 5. Pivot charts were added in Excel 2000. A Pivot Table is an interactive table that you can use to quickly summarize large amounts of data. You can rotate—or pivot—its rows and columns to see different summaries of the source data, filter the data by displaying different pages, or display details for areas of interest.

We can invoke the PivotReport wizard by going to the "Insert" ribbon, clicking on "PivotTable" in the "Tables" group, and selecting "PivotTable" from the dropdown menu.

The "Create PivotTable" dialog box will appear. Here, you will tell Excel where the data to analyze is stored, and where you'd like to place the PivotTable. Once the PivotTable framework has been established, the PivotTable can be created by dragging and dropping fields from the "PivotTable Field List" onto the defined areas beneath the Field List (or the PivotTable itself if using the optional Excel 2003 interface).

PivotTable basics

Fields we're interested in *summarizing by* go into the "Row Label" and "Column Label" areas of the PivotTable (hereafter generally referred to as "Row" and "Column". For our exported fund activity data, these fields would be "Fund Code", "Fund Name", "Date", and "Report Date".

Fields we're interested in *summarizing* go into the "Values" area (hereafter referred to as either "Values" or "Data" (in a nod to what it was called in earlier Excel versions)). For our exported fund activity data, these fields include "Appro", "Exp", and "Enc" (our three monetary fields).

**PivotTable Exercise 1: What are the totals for expenditures, YTD, for all funds?**

Make any cell in the list the active cell.

Go to the "Insert" ribbon, "Tables" group, and click on "PivotTable" image.

In the "Create PivotTable" dialog box, ensure the correct range of cells has been selected (A6:K2645) under the option "Select a table or range". Place the PivotTable on its own worksheet. Click "OK".

The PivotTable framework is created on its own worksheet. The "PivotTable Field List" (hereafter generally referred to as "Field List") will appear off to the side. What your PivotTable will look like

depends on how your PivotTable options are set. We want to use the "2007" interface (shown below) and not the "classic" one.
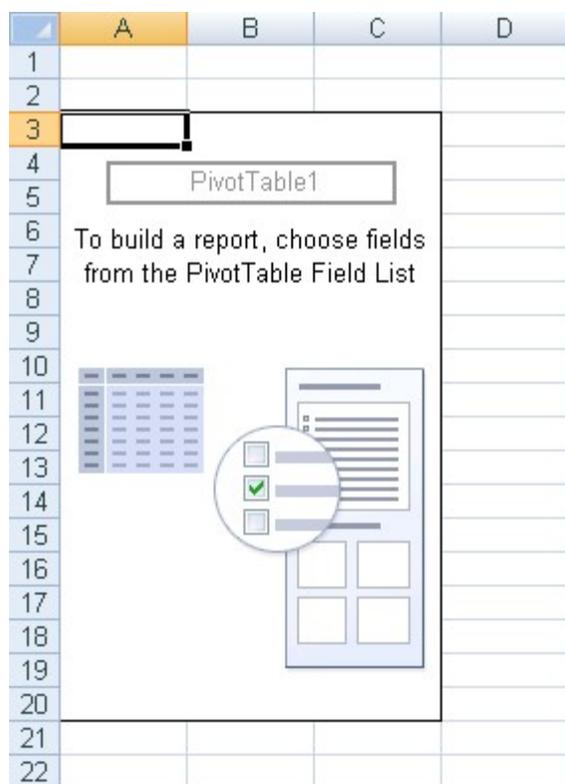
To switch between PivotTable interfaces: *Right-click anywhere in the PivotTable. From the context menu, select "PivotTable Options". In the "PivotTable Options" dialog box, select the "Display" tab. Select the checkbox next to "Classic PivotTable layout…" to use the classic interface. Clear the checkbox to use the 2007 interface.* **Be sure the checkbox is cleared for our purposes.**

Drag "Fund Code" from the "PivotTable Field List" to the "Row" area beneath it. Note how column A is now populated with all of the fund codes.

Drag "Exp" from the "Field List" to the "Values" area. This isn't quite what we expected, is it? Instead of seeing a sum of expenditures, we're seeing a count of them—that is, the number of records that have a value in "Exp" for each fund code. Why? Because there isn't a value for "Exp" in all records, Excel incorrectly assumes we want a count of non-blank "Exp" fields. This is easy to correct.

Click on the down arrow of "Count of Exp" in "Values" and select "Value Field Settings". In the "Value Field Settings" dialog box, change the "Summarize value field by" selection to "Sum". Note the change in the "Custom Name" text box, which can be overwritten at any time here.

Also in the "Value Field Settings" dialog box, click on "Number Format", select "Accounting" from the resultant "Format Cells" dialog box and set the currency symbol and decimal places options.

Click "OK" to dismiss "Format Cells", then click "OK" to dismiss "Value Field Settings".

Look at all of these calculations! It would have taken us awhile to replicate this amount of work that the PivotTable put together in less than a second. You'll also note that, for all the calculations performed here, you didn't even have to hit the equals key. Formula-phobes can breathe easy—or at least easier!

PivotTable Exercise 2: What are the totals for expenditures, YTD, for all funds, broken down by reporting month?

Drag "Report Date" from the "Field List" to the "Column" area beneath it. You've just added a new dimension to the report by adding a column field.

More impressive calculations! Imagine how long it would take to get this type of report using filtering and SUBTOTAL.

Scroll to the bottom of the PivotTable. Note the grand total displaying by reporting month.

Scroll to the right edge of the PivotTable. Note the continued display of the grand totals calculated from the previous exercise.

In the context-specific "Options" ribbon, " in the "Show/Hide" group, click on "Field List" to easily toggle display of the Field List and the layout area under it.

Don't like all the blank space for zero values? *In the context-specific "Options" ribbon, PivotTable group, click on "Options". In the "PivotTable Options" dialog box, select the "Layout & Format" tab. Clear the checkbox for "For empty cells show" for the best display.*

Want to turn off automatic totals? *In the "PivotTable Options" dialog box just opened, click on the "Totals & Filters" tab. Set options as desired under "Grand Totals".* **For our purposes, keep both "Grand Total" options on.** *Click "OK" to close.*

PivotTable Exercise 3: Provide a breakdown for selected fund codes

You may not be interested in all of the data. Excel's PivotTable functionality lets us select only row/column data elements of interest to us and automatically recalculates any Grand Totals.

Select the dropdown arrow next to "Row Labels" in cell A4.

Click on "Select All" to clear all checkmarks and select the three "mar" and three "fin" fund codes.

Click "OK" to close the dropdown menu. Note the new display and the automatic changes to the Grand Total values.

Similar steps can be used to control any field in either the "Rows" or "Columns" area of the PivotTable.

PivotTable Exercise 4: Add appropriations and encumbrances to the report and remove breakdown by Report Date

See where we're going with this? Watch how Excel can easily take care of these tasks.

First, let's display all fund codes again. *Select the dropdown arrow next to "Row Labels" in cell A4. Click on "Select All" to reselect all fund codes. Click "OK".*

Next, let's remove the breakdown by "Report Date". *As needed, display the "Field List", click on "Report Date" in the "Column" area, and drag it back up to the "Field List".*

Drag "Appro" and "Enc" from the "Field List" to the "Values" area.

Change the handling of the fields in the "Values" area to add them instead of count them, and change the number format to "Accounting" just as we did earlier with "Exp". Another way of doing this is to right-click anywhere within a calculated data point or the label of any given field and select "Value Field Settings" from the context menu, making changes as instructed earlier in **PivotTable Exercise 1**. *Yet another way is to set the number format via the context menu("Number Format" option) and change the calculation performed by selecting the appropriate value from the context menu option "Summarize Data By".*

Let's put these in the order of "Appro", then "Exp", then "Enc".

In the "Values" area, drag and drop the three boxes so that "Appro" is on top, then "Exp", then "Enc".

Is our PivotTable starting to take on an oddly-familiar, characteristic shape to you?

Calculating Free Balance, Cash Balance, and % Exp

You may have guessed that we're on our way to creating a detailed financial report. Or perhaps you've attended one of my IUG presentations that formed the basis of this portion of the workshop and already knew that. With the lion's share of the data calculation behind us (and easily, too, thanks to PivotTables), let's focus our attention on generating free and cash balances and % exp—the three columns calculated on every detailed financial report.

As a refresher:

Free Balance is always equal to <appropriations> - <expenditures> - <encumbrances>

Cash Balance is always equal to <appropriations> - <expenditures>

% exp is equal to 1 – (<free balance> / <appropriations>)

We have three of these numbers already provided by the PivotTable, and the fourth, free balance, is calculated here. Let's add these calculations to our PivotTable.

Add the labels "Free Bal", "Cash Bal" and "% exp" to cells E4, F4, and G4, respectively.

Make E5 the active cell. TYPE in the following: =B5-C5-D5

We want to TYPE in these cell references instead of using a point-and-click approach because we need to use relative cell references to complete identical calculations for the other fund codes. Clicking on the cells instead of typing them creates references to a function called GETPIVOTDATA which relies on the static labels in the tabled data.

Make F5 the active cell. TYPE in the following: =B5-C5

Again, these cell references must be typed, for the exact same reason listed earlier.

*Make G5 the active cell. TYPE in the following: =IF(B5<>0,1-(E5/B5),"**")*

Why have we buried the % exp calculation in an IF function call? Simple. If our appropriation for any given cell is either zero or undefined, we'll get a nasty division by zero error. The IF function accounts for that, and tells Excel to perform the calculation if appropriations is NOT zero, but to display two asterisks if it is.

Highlight the range of cells E5:G5. Using the fill handle at the lower right-hand corner of the selected cells, complete calculations for the rest of the fund codes and the row containing the Grand Totals.

Select column G. From the "Home" ribbon, "Number" group, click on the percent sign. Increase or decrease the number of decimal places maintained for the percentages using the two buttons located in the lower right area of the "Number" group.

Congratulations!! You've just created a detailed financial report!

Truth be told, we haven't created a **complete** detailed financial report just yet. While we do have all of the necessary calculations and numbers for all of the funds, there is one element missing: hierarchies.

Our next set of exercises introduces us to a new and valuable group of functions in Excel called LOOKUP and combines this with the power of PivotTables to provide us with a truly comprehensive detailed financial report—one that can even go far beyond what our Millennium systems can give us—with only a small amount of additional effort on our part.

Before we continue down that road, though, here are a few parting comments about PivotTables.

- When a PivotTable is created against a list of records, ALL records (even those whose display may be suppressed through use of a filter) are used. The best way to accommodate for this condition is to use Advanced Filter and place the filtered data in a different area of the same worksheet, creating a PivotTable off of that newly-placed data. **This one-two punch is the key to generating a detailed financial report for any time period you want.**
- Always remember that a PivotTable is only a data summary. You cannot harm underlying data by manipulating PivotTable views or changing PivotTable options.

Creating a hierarchical detailed financial report

We've got the basic structure of a detailed financial report with our PivotTable and three additional calculations. Many, if not all of us, however, keep our funds in a hierarchical structure. The ability to summarize by this hierarchical structure is currently missing. To see how we can solve this, let's examine what happens when we create a PivotTable.

During the process of PivotTable creation, Excel takes the fields that are placed in the "Row" and "Column" areas and performs user-selected calculations on the fields listed in the "Values" area for "Row"/"Column" labels that are identical across the records for PivotTable creation. For example, if there are three records with "acc/b" fund codes with "Exp" values and we place "Fund Code" in the "Row" or "Column" area and "Exp" in the "Values" area, Excel will take those three records and act as we tell it to on the "Exp" values, displaying "acc/b" in the "Row" or "Column" area and the calculated result in the "Values" area. Our previous example had the PivotTable add them, but there are several other options as well as seen in the "Value Field Settings" dialog box.

Therefore, if we were to manually add more columns to our exported data and make the labels in these new columns *exactly* the same for each record we wanted to combine, we could take those new columns and place them in the "Row"/"Column" areas of the PivotTable and have it work its magic. We could even create new types of categories to create brand new hierarchies that wouldn't otherwise fit into the hierarchies we've established on our systems.

Where can we get these categories? Well, we can make them up if we want to—after all, Excel is only a stupid computer program and will dutifully do what we tell it to do. But we've already got a hierarchical system we can use for starters, and the traditional detailed financial report gives it to us in black and white.

Consider this snippet from the detailed financial report we created earlier (listing fund codes, not names):

```
ALL ACCOUNTS : ACCOUNTING REPORT   -- FY 2007 final report 8/3/07 JES
                                Appropriation  Expenditure  Encumbrance  Free Balance  Cash Balance      %
ALL ACCOUNTS
   MATERIALS ACCOUNT
      BOOKS
         acc/b                     $4,110.00     $603.40      $476.74     $3,029.86     $3,506.60      26%
         be/b                      $5,351.00   $2,551.79    $1,384.84     $1,414.37     $2,799.21      74%
         ...
         rep/b                         $0.00       $0.00    $1,829.00    -$1,829.00         $0.00     **%
         sms/b                     $2,998.00       $0.00      $328.20     $2,669.80     $2,998.00      11%
      BOOKS          Total        $99,292.00  $32,793.69   $19,643.57    $46,854.74    $66,498.31      53%
      PERIODICALS
         acc/p                    $16,256.00  $10,220.36    $6,035.64         $0.00     $6,035.64     100%
         be/p                     $12,806.00   $9,693.23    $3,203.77       -$91.00     $3,112.77     101%
         ...
         rep/p                         $0.00       $0.00        $0.00         $0.00         $0.00     **%
         sms/p                     $6,826.00   $6,129.55      $696.45         $0.00       $696.45     100%
      PERIODICALS    Total       $224,285.00 $140,838.33   $83,366.95        $79.72    $83,446.67     100%
      OTHER
         acc/o                    $13,809.00  $10,853.37    $2,955.63         $0.00     $2,955.63     100%
         be/o                      $1,559.00   $4,142.76      $666.24    -$3,250.00    -$2,583.76     308%
         ...
         rep/o                         $0.00       $0.00        $0.00         $0.00         $0.00     **%
         sms/o                       $504.00     $148.66      $355.34         $0.00       $355.34     100%
      OTHER          Total       $196,596.00 $175,104.05   $43,135.44   -$21,643.49    $21,491.95     111%
      DATABASES
         Electronic Databases
            edb                  $593,363.56 $810,893.14 -$115,760.69  -$101,768.89  -$217,529.58     117%
         Electronic Databases  Total $593,363.56 $810,893.14 -$115,760.69 -$101,768.89 -$217,529.58   117%
      DATABASES       Total      $593,363.56 $810,893.14 -$115,760.69  -$101,768.89  -$217,529.58     117%
      MISCELLANEOUS
         Course Reserves
            rsvc                     $166.00       $0.00      $438.86      -$272.86       $166.00     264%
         Course Reserves  Total      $166.00       $0.00      $438.86      -$272.86       $166.00     264%
         Binding
            bd/b                       $0.00       $0.00        $0.00         $0.00         $0.00     **%
            bd/o                       $0.00       $0.00        $0.00         $0.00         $0.00     **%
            bd/p                       $0.00       $0.00        $0.00         $0.00         $0.00     **%
         Binding       Total          $0.00       $0.00        $0.00         $0.00         $0.00     **%
         Commerce Park
            compk                      $0.00       $0.00        $0.00         $0.00         $0.00     **%
         Commerce Park  Total          $0.00       $0.00        $0.00         $0.00         $0.00     **%
      MISCELLANEOUS   Total           $166.00       $0.00      $438.86      -$272.86       $166.00     264%
   MATERIALS ACCOUNT  Total $1,113,702.56 $1,159,629.21   $30,824.13   -$76,750.78   -$45,926.65     107%
   ROSENTHAL ACCOUNT
      rosen                       $35,086.98  $10,054.65        $0.00    $25,032.33    $25,032.33      29%
      rob/b                            $0.00       $0.00        $0.00         $0.00         $0.00     **%
      rob/o                            $0.00       $0.00        $0.00         $0.00         $0.00     **%
      rob/p                            $0.00       $0.00        $0.00         $0.00         $0.00     **%
   ROSENTHAL ACCOUNT  Total     $35,086.98  $10,054.65        $0.00    $25,032.33    $25,032.33      29%
   OTHER ACCOUNTS
      bloom                       $39,915.49       $0.00        $0.00    $39,915.49    $39,915.49      0%
      gies                             $0.00       $0.00        $0.00         $0.00         $0.00     **%
      gift                           $758.94       $0.00        $0.00       $758.94       $758.94      0%
      halp                        $11,584.14       $0.00        $0.00    $11,584.14    $11,584.14      0%
      huff                         $7,387.45       $0.00        $0.00     $7,387.45     $7,387.45      0%
      lost                        $17,027.99    -$871.15      $135.95    $17,763.19    $17,899.14     -4%
      schoo                        $2,154.83       $0.00        $0.00     $2,154.83     $2,154.83      0%
      edbcm                            $0.00       $0.00        $0.00         $0.00         $0.00     **%
   OTHER ACCOUNTS     Total      $78,828.84    -$871.15      $135.95    $79,564.04    $79,699.99     -1%
ALL ACCOUNTS          Total  $1,227,618.38 $1,168,812.71   $30,960.08    $27,845.59    $58,805.67      98%
```

Starting with any given fund code and working outwards (excluding the last category of "All Accounts", since the PivotTable's Grand Total option can provide that calculation for us) we can create a new column of labels for every indentation in the report up to the fund codes themselves.

Consider "acc/b"….the outer-most category for that would be "Materials Account". The next category in would be "Books". The next indentation takes us to the fund code itself, so we'd be done.

What about "sms/o"? The outermost category is still "Materials Account". The next category in would be "Other". The next indentation takes us to the fund code itself, so, again, we'd be done.

What about the "huff" account? The outermost category here is "Other Accounts". That is the only category for this fund code. In this instance, we'd leave next category in blank, since it's not defined for this fund code.

This type of approach only works when each and every fund code is listed exactly and only one time in the report. This eliminates the possibility that any given fund code would have TWO of any given type of category that we'd determine in this manner.

So now we've figured out how to get at least some categorization done. But we now need to add these fields to *each and every* record in our list. Typing them, one by one, of course, is simply out of the question.

Perhaps you're thinking "I know….I'll sort by fund code and use the fill handle, typing in the values for the first record in the list and populating all other records with that fund code in that manner!" Well, that might work if you had a small dataset. But for a dataset of any modest size (and one that is constantly getting added to), this really is not a practical solution.

Then you have a brilliant idea! "I know….I'll create a nice complicated IF function and use that!" Well, I hate to burst your bubble, but that is also pretty impractical. Besides being unwieldy and nearly impossible to read and troubleshoot, Excel only supports a limited number of nested functions. In Excel 2003, this limit was 7. In Excel 2007, it's 64. Very complicated fund structures with lots of hierarchies might still have a problem.

Wouldn't it be great if Excel provided us a means of taking any given label and "translating" it to another label by simply looking it up in a list or table? This type of function would allow us to look up a fund code and then change it to another label in the same row or column as the fund code by specifying the column or row we'd like it to change to.

The good news is, of course, that Excel does that with a group of functions called LOOKUP. LOOKUP has three flavors:

VLOOKUP is used for data arranged vertically (in columns)
HLOOKUP is used for data arranged horizontally (in rows)
LOOKUP allows for data to be either vertical or horizontal

Since we are used to seeing our data arranged vertically, we'll be using the VLOOKUP function.

VLOOKUP takes the following form and contains four arguments:

VLOOKUP (lookup_value, table_array, col_index_num, [range_lookup])

- "lookup_value" is the cell we're interested in translating.
- "table_array" is the list or table we want to use to translate. The first column of table_array must always be the column that we are interested in translating, else VLOOKUP will not work. This table can be on the same worksheet, in the same workbook (on a different worksheet), or even in a separate Excel workbook altogether. This final option is the one we'll use.
- "col_index_num" is the NUMBER of the column *relative to the column being translated*. This is actually much easier than it sounds.
- "range_lookup" is an optional logical argument that allows us to force matching. To force VLOOKUP to find an exact match for the label being translated, set range_lookup to FALSE. Note that the default is TRUE, so we will always specify this argument because we always want to force matching when translating labels.

Constructing the VLOOKUP table

We've already done the brainwork behind this a few pages ago by looking at a traditional DFR, so we know what we want to put here; it's a matter of getting it constructed. After all, before we can actually use VLOOKUP, we need to have the table to do the translating for us.

Unlike a regular list or table, this list does NOT need a header row, since our sole purpose for putting it together is as a translation device, not for any type of analysis or computational purpose.

While it is possible to get a list of fund codes (and their long names) out of the character-based system (from the Main Menu, command sequence M (MANAGEMENT Information) → I (Information about the system) → C (CODES used) → F (FUND codes), print that to the e-mail printer, and then import it as a fixed-width text file into Excel to set up a column to define your fund codes, many I've talked to have found it easier just to type the fund codes in a column.

IMPORTANT! When constructing your column of fund codes, you must make all of your fund codes 5 characters long, padding with trailing spaces as necessary to get the full 5 characters. Why? When Excel exports the fund code for each transaction, it sends 5 characters out of the system for each fund code, padding them with trailing spaces as needed. When Excel invokes any of the LOOKUP functions or PivotTable construction, spaces are included in the process that determines what records can be combined. We must match this exactly, or else our VLOOKUP call will fail or we'll end up with what appear to be identical rows/columns in our PivotTable, the extra spaces being the difference that causes this to happen.

Open the file "FAR blank VLOOKUP.xlsx". This is a workbook that already has all of the fund codes listed for us, padded with trailing spaces as necessary.

Look at A1 (acc/b). Referring to the DFR of a few pages ago (and ignoring the outermost hierarchy of "All Accounts"), we see we have two categories here: "Materials Acct." and "Books" Type "Materials Acct." in B1 and "Books" in C1. Some hierarchies go three levels deep. Those that don't (like this one) will need to have a single space inserted in its respective column D entry to allow VLOOKUP to return a proper label instead of an error because nothing has been entered in the cell.

Look at A2 (be/b). How many categories are there? What will they be? Type the categories from outermost to innermost in the other cells in row 2, keeping similarly-indented headings together with those from row 1 since they represent the same level of the hierarchy.

Note here that AutoComplete is your best friend. With AutoComplete, Excel will predict what you're typing and allow you to accept its prediction by hitting Tab or Enter at the point you'd like to accept the prediction. Use of AutoComplete will provide you with the precision you require in order to ensure that the labels you are selecting for each fund code in each column are, in fact, exact in every detail (as they need to be).

Look at A42 (sms/o). How many categories? What are they? What about for A78 (halp)?

Continue on in this vein until all fund codes have been completed. This is a class, not a typing exercise, so you'll be delighted to know that the work has already been completed.

Close "FAR blank VLOOKUP.xlsx". It is not necessary to save any changes.

Open "FAR VLOOKUP.xlsx" to see a completed VLOOKUP table. Keep this workbook open to facilitate its immediate use in the next exercise.

Adding new fields to FAR data

Our intent at this stage is this: To look up the fund code in column A for any given record and "translate" it to an appropriate hierarchical header in another column using VLOOKUP and the FAR VLOOKUP workbook..

Return to the "FAR Data" worksheet in "FAR Data.xlsx". As necessary, remove any filters.

In L6, M6, and N6, type "Cat 1", "Cat 2", and "Cat 3", respectively. These serve as labels in our header row that we will call upon when setting up another PivotTable. Still wanting to keep our well-formatted list characteristics in place, we provide each of these with a unique label.

In cell L7, we'll construct a VLOOKUP function. Let's construct the arguments one at a time:
- lookup_value: We want to look up the fund code in this record. It occupies cell A7. **A7** is our lookup_value.
- table_array: This is located on "Sheet1" of the workbook "FAR VLOOKUP Table.xlsx". The fund codes are in column A of that worksheet, so column A must, because of the way VLOOKUP works, be the first column in our array. Properly formatted and with "FAR VLOOKUP.xlsx" open, the table array would look like this: **'[FAR VLOOKUP.xlsx]Sheet1'!$A:$B** .
- col_index_num: Relative to what is being looked up (the fund code, which occupies the first column), we want to translate this into the outermost hierarchy, which is the second column. Thus, **2** is our col_index_num.
- range_lookup: This will be set to **FALSE** to force matching (and will return an error if no exact match is found).

Let's put them together:

In L7, type =VLOOKUP(A7,'[FAR VLOOKUP.xlsx]Sheet1'!$A:$B,2,FALSE) Note that, instead of typing in the complete reference for the table_array argument, we could also point-and-click our way there, selecting columns A and B of "Sheet1" in "FAR VLOOKUP.xlsx". If we've done everything correctly, L7 will now read "Materials Acct."

The VLOOKUP function call for M7 and N7 is nearly identical:
- lookup_value is **A7** for both calls (we are still interested in translating the fund code).
- table_array is still in the same location. We must be sure, however, to include the additional columns that we want to translate the fund code into.
- col_index_num will be set to "3" for M2 and "4" for N2, as we want to use the second and third columns relative to the fund code (the first column) to determine the translated label.
- range_lookup will be set to **FALSE** for both calls to force matching.

The function call in M7 will look like this:

=VLOOKUP(A7,'[FAR VLOOKUP.xlsx]Sheet1'!$A:$C,3,FALSE)

and will translate to "Books"

The function call in N7 will look like this:

=VLOOKUP(A7,'[FAR VLOOKUP.xlsx]Sheet1'!$A:$D,4,FALSE)

N7 will translate into an empty cell, since the 4th column for that fund code has been set to a blank.

Select the range of cells L7:N7. Complete these fields for all records in the FAR data.

Constructing the hierarchical detailed financial report

With our new fields now complete, we can create a new PivotTable that uses them. When multiple fields are placed in either the "Row" or "Column" areas of the PivotTable, they are automatically nested from top to bottom (note that this does NOT happen in the "Values" area, as we saw with our earlier example).

Open, as needed, "FAR data with hierarchies.xlsx".

Place the active cell in the FAR data.

Invoke the PivotTable wizard ("Insert" ribbon, "Tables" group, "PivotTable" icon). Verify the correct range of cells is selected by Excel(A6:N2645) and place the PivotTable on its own worksheet.

In the "Field List", place "Cat 1", then "Cat 2", then "Cat 3", then "Fund Code" in the "Row" area. They should be listed in that order, top to bottom, to ensure the hierarchical display we want.

In the "Values" area, place, in order, "Appro", then "Exp", then "Enc".

Change the field settings for "Appro", "Exp", and "Enc" to add them instead of count them. Also change the number formatting to "Accounting". Do this using "Value Field Settings" or a combination of context menu selections.

Insert labels "Free bal", "Cash bal", and "% exp" in row 4 cells immediately adjacent to the PivotTable.

Calculate free balance, cash balance, and % exp in row 5 under their respective labels:

Free Balance*:* <appropriations> - <expenditures> - <encumbrances>
Cash Balance: <appropriations> - <expenditures>
% exp: 1 – (<free balance> / <appropriations>)   (Be sure to nest this in an IF statement)

Select the just-completed formulas and use the fill handle to calculate the rest of the balances.

The holy grail! A fully-realized hierarchical detailed fund activity report, based on our current hierarchical structure.

We can change the appearance of this using the "PivotTable Styles" group of the context-specific "Design" ribbon. Let's play around and see what we get.

Using Advanced Filter and sending the results of that filter to a separate area of the worksheet, you can create PivotTable on that filtered data and create a detailed financial report for any subset of your exported fund activity data that you want! (Yes, I mentioned this earlier. It bears repeating!)

There is but ONE flaw to this, our fund reporting Utopia: Funds with absolutely no activity will not be listed in the report. A PivotTable cannot summarize something that it doesn't even know exists.

Also note that you will not want to construct free balance, cash balance, or % exp until after you've got the layout and style of your PivotTable finalized. Adding or removing elements from the PivotTable—or changing styles—will adjust the PivotTable itself, but your manual calculations are NOT part of the PivotTable and will NOT automatically shift positions as the PivotTable shifts based on your selections.

There are other possibilities here. By adding additional columns to the VLOOKUP table and using the methods just outlined, you can create all sorts of reports with new summary fields or hierarchies, such as reports by selector, discipline, or funding source. Note that any sort of new hierarchical arrangement

relies on the fact that any given fund code can be placed in one (and only one) choice for any category defined, just as with our previous example.

Open "FAR extended VLOOKUP.xlsx".

Here's the VLOOKUP table used in the last exercise, but with two additional columns, one which reflects the name of the selector responsible for the fund, the other reflecting the discipline the fund code primarily represents. Just as with other columns, labels do not have to be specified for all fund codes, but fund codes with no definition for any given field must have a single space inserted in the cell to function as a placeholder.

Open "FAR Selector and Discipline.xlsx"

This has the same FAR data we've been using all along, but there are now two new columns (one for Selector, the other for discipline). Just as with Cats 1-3, these labels were gathered for each record using VLOOKUP, referencing the "FAR extended VLOOKUP.xlsx" file.

Go to the "Selector" worksheet within "FAR Selector and Discipline.xlsx".

Here's a PivotTable (with no balance calculations) with "Selector", then "Fund Code", in the "Rows" area and our friends "Appro", "Exp", and "Enc" in the "Values" area.

Want aggregated data only by selector?

Clear the checkbox next to "Fund Code" in the "Field List".

Give me the aggregated data just for Sterbenz and Berdish.

Click on the dropdown arrow in A4 ("Selector"), remove the "Select All" checkbox and check only the boxes for "Sterbenz" and "Berdish".

Let me see Sterbenz and Berdish numbers, by fund.

Open the "Field List", as needed. Select the checkbox next to "Fund Code" in the "Field List". Excel should remember where it was when it was originally a part of the PivotTable and place it there again. If it doesn't, simply move it under "Selector" in the "Row" area.

Go to the "Discipline" worksheet within "FAR Selector and Discipline.xlsx". Remove "Fund Code" from the PivotTable to see aggregated numbers by discipline.

The fund reporting world is now your oyster! Enjoy, and dazzle everyone with the reports you will be able to generate at will using the tools just discussed!

These tools have broader application to the reports we can get out of Millennium. Let's see how we can use these tools to improve the reporting of circulation statistics next, with a discussion of how we can use these tools to graph data of interest to us. The context is different, but the underlying principles remain the same.

Close all workbooks/files. It is not necessary to save changes.

Working with Circulation Reports

We can generate a variety of circulation reports using Millennium's Web Management Reports interface. The URL to access these reports is http://<your INNOPAC IP address or machine name>/manage, *e.g.*

http://lib.bus.umich.edu/manage, or
http://141.211.239.215/manage

Reports generated using this "classic" interface (called the "Web browser interface" by III) will be the subject of our scrutiny today, as they cover a broader spectrum of activity than their new Release 2007 counterparts. Release 2007 users have an additional option at http://<IP address or machine name>/iii/webrpt to use what Innovative calls the "spreadsheet interface" because it generates Excel workbooks instead of text delimited files which must then be imported into Excel.

We can access a number of different reports here. Our efforts will focus on circulation reporting.

Getting the data out of Millennium

MGR #105432 describes the different (non-cross-tabbed circulation) reports available. You must be authorized for function 017 (Circulation Statistics) to generate these reports.

Creating a table of checkout statistics by branch

For this report, we'll be working with the "All Activity" reports that can be generated from the "Circ Activity" function in the "Circulation" area.

Open up Web Management Reports' Web Browser interface.

On the left side of the screen, under "Circulation", click on "Circ Activity".

Provide an authorized set of credentials ("initials and password") when prompted.

Under "Circ Stats", click on "All Activity". Under "Dates", select "User spec". Under "Sort by", select "Item Location". Click on "Submit".

36 months of data are available, including the current month. Since we might be interested in constructing a month-to-month comparison, either with any given year or between years, data collection for this workshop has been performed at the monthly level, though it is possible to select any range of contiguous or non-contiguous months.

After selecting the month(s) desired, click on "Submit Query".

Refresh the screen (by clicking on "STATUS" as needed) until the report appears.

Save the report as a delimited text file by clicking on the "Download" icon near the top of the screen.

Save the file using methods appropriate for your browser of choice. Rename the file as desired, including a file extension of "txt", e.g. Circ200701.txt

Any text file captured will need to be converted into an Excel workbook in order to be correctly referenced by other Excel workbooks. For the purposes of this workshop, all of the .txt files collected by

the system have been converted into Excel files for you. We'll open and convert one just to see what it's like.

In Excel, open the file "Circ by item loc 200607.txt". This file, like all of them, is a delimited file, with the pipe as the delimiter. Import all columns using the "General" data format. Note that we need not do anything special to prepare these files. Simply by selecting the correct importing options, we can create any file we'll need to reference with minimal effort. Note that the original file name (minus the txt extension) is now used as the worksheet name.

Note how location code is used here. Only locations with activity are reported, and these are going to vary from month to month. The location listed in row 20 in January might be listed in row 25 the next.

Close "Circ by item loc 200607.txt". Do not save when prompted. As mentioned earlier, a converted file is already provided for you here.

We need to somehow account for these different row locations. Here's how: We'll create a "master list" of all location codes and their corresponding long names. It will serve two purposes—the first, a basis for a table we can use for VLOOKUP, the second, a basis for a table we'll construct to run analysis on.

The master list of location codes and their corresponding long names is available only in the character-based system (Millennium will only list the codes), from the command sequence M (MANAGEMENT information) → I (INFORMATION about the system) → C (CODES used) → B (BRANCH codes). Printed to the e-mail printer, it can be saved as a text file and imported into Excel as a fixed-width file for easy parsing of the file into codes and names.

Importing as we do into Excel will strip any trailing spaces from the location codes. Add, as needed, trailing spaces to location codes to reach the 5-character length. This can be done in a number of different ways, but many might just find it easier to type the extra spaces manually!

The end result of this necessary preparatory work can be found in the file "Circ Branches.xlsx".

Open "Circ Branches.xlsx". Columns A and B represent the data as exported (location code and long name). Note two additional columns—one which groups locations codes by physical branch, another which groups them by subcollection. "Circ Branches.xlsx" will be used in conjunction with VLOOKUP to create new fields for our collected data, which will, in turn, be used in PivotTable calculations.

For what we're about to do, we want our formula bar to be large. *Carefully position the cell pointer between the formula bar and the worksheet until it becomes a horizontal resizing (two-headed) cursor. Click and drag downward until the formula bar is at least 4 lines long.*

Let's complete our header row. *For the other cells in row 1, use a month-year approach to label creation. In our instance, label cells E1 through P1 "July 2006" to "June 2007". Use the fill handle after completing E1 to make the job easy!*

Open the file "Circ by item loc 200607.xls". To ease entry of the external workbook call, we're about to make in VLOOKUP, we want this file open.

Now, we'll use VLOOKUP to pull in the checkout numbers for all of the different location codes.

Back in "Circ Branches.xlsx", in E2, enter the formula =VLOOKUP($A2,'[Circ by item loc 200607.xls]CircAllActItemLoc200607'!$A:$H,2,FALSE). Use point-and-click methods to easily generate the table_array argument. **If you prefer, open the file "Circ VLOOKUP functions.txt" in Notepad and copy/paste the first line into E2.**

Not quite what we expected, is it? Our VLOOKUP function is working fine….the problem lies in the fact that this particular location code (admin) is "Not available" in the table array being referenced, so Excel returns the #N/A error.

We need to account for the error using the Excel ISERROR function. If the VLOOKUP function call returns any error at all (of which #N/A is one), we should have it display nothing—otherwise, it should return the value. PivotTables do not respond nicely to the presence of errors in fields that end up in the "Values" area, so our use of this is necessary.

Read the above again, more carefully. We've outlined exactly what we need to do. At a higher level, our function call would read like this:

=IF(ISERROR([VLOOKUP function call]),"",[VLOOKUP function call])

While we *could* change the function call in E2, we're instead going to place the function call in a cell I know will yield a real numerical result: E26

In E26, enter the following formula:

=IF(ISERROR(VLOOKUP($A26,'[Circ by item loc 200607.xls]CircAllActItemLoc200607'!$A:$H,2,FALSE)),"", VLOOKUP($A26,'[Circ by item loc 200607.xls]CircAllActItemLoc200607'!$A:$H,2,FALSE)) Use point-and-click for table array calls at your discretion. **Or, copy the second line from "Circ VLOOKUP functions.txt" and paste it in E26.**

If you've typed and point-and-clicked (or even just copy/pasted!) everything correctly into E26, the formula returns a value of 244.

You will notice we've made both column references of VLOOKUP's first argument absolute. This will allow us to use the fill hand across the rest of row 26. We then only need to change the month in the file name and worksheet references of the table arrays in *both* VLOOKUP function calls.

Close "Circ by item loc 200607.xls". This will update the table_array arguments in E26 by augmenting the file name with its complete path.

Select E26(note the new, complete path) and use the fill handle to populate the range of cells F26:P26.

All values in row 26 read "244". Of course they do, since all of the formulas point to the same data from July 2006. Now we need to manually (unfortunately!) change the month/year references in each of the remaining

Change the year/month numbers in the table_array arguments for the rest of row 26, e.g. for F26 (August 2006), any reference to "200607" should be changed to "200608". Note that there will be **four** such changes that will need to be made in every cell. Don't forget to change the year in January (and for all six months in 2007!)

If you've done everything correctly, row 26 should look like this:

24	rsvi	Reserves		Kresge	Reserves												
25	rsvz	Reserves		Kresge	Reserves												
26	sta	Stacks (4th Floor)		Kresge	Stacks	244	307	481	482	388	281	658	406	487	359	345	314
27	staa	Art Collection (2nd Floor)		Kresge	Stacks												
28	stab	UM Flint Stacks		Flint	Stacks												

If Excel prompts you for a file location after you hit Enter to finalize any given formula, it is telling you it can't find the file you specified, and is asking you to select one so it can create the proper link. Recheck your typing or navigate and select the correct file. Be sure to also check that your date references for workbooks are correct.

Entering the initial formula, copy/pasting, and then changing all of the file references for the other months is EASILY the most difficult portion of this job (and of this workshop). But your few minutes of effort and diligence is about to pay off, for with one record completed (the one for "stacks"), we can now use the fill handle to complete every other record in our list.

Select the range of cells E26:P26. Use the fill handle to populate the rest of the table in one direction (down or up), waiting for Excel to finish all of its work before going in the opposite direction. Watch the status bar to determine progress.

It is not yet time to be impressed. All we've really done at this point is pull in all of our data points from across 12 different workbooks into a single workbook so we can perform analysis on them. Well, we can be a little impressed and a lot relieved that we just made Excel do all of the dirty work for us.

Now, we'll create a PivotTable, placing "Branch", then "Subcoll" in the "Rows" area and each of the months in the "Values" area.

Open, as needed, "Circ Branches with data.xlsx".

Create the PivotTable, placing it on its own worksheet. The range of cells is A1:P381.

That Darn Excel! Again, it thinks we want counts! We want sums. *Right-click in any "Date" column in the "Data" area. From the context menu, select "Summarize Data By", then "Sum". Repeat for all months.*

NOW we can be impressed. Millennium, while it DOES give us breakdowns by individual location codes, DOESN'T do anything to combine them for us in a meaningful manner. By identifying each location code with a branch (and a subcollection within that branch, if we wanted, so we could compare, say, "stacks" collections across branches), we can use the power of PivotTables to generate these numbers quickly and easily.

Interested in viewing this by "Subcoll", then "Branch"? Simply switch their order in the "Row" area of the "Field List". Note that, because many subcollections are associated only with one branch (MeLCat), this is not as pretty a display.

Interested in the breakdown by actual item location, not subcollection? Remove "Subcoll" from the "Row" area. Drag "Loc Code" or "Long Name" from the "Field List" to the "Row" area, placing it underneath "Branches". Note that this view rearranges the data underlying the PivotTable in such a way that all location codes affiliated with any given branch are efficiently collected.

In Web Management Report's traditional interface, we can get a report *close* to this (without additional transcription). To get exactly what we see here, though, several additional steps are required, and at least one of them involves transcription. Any time transcription is involved, we introduce the possibility of error. In our exercise, consider how many data points we entered manually. The answer is NONE. All of our data points (12 months * 380 locations = 4,560) were gathered by using VLOOKUP. How many

calculations did we perform? Again, the answer is NONE. We used the power of PivotTables in Excel to do all of the work for us. Creating additional fields by which to summarize our data (branches and subcollections) allowed us to add a new dimension to our reporting as well. While we'd have been able to gather a report branch by branch, there is no way to do what we did. The secondary summation we did by subcollection is not possible within Millennium. Nor is it possible to so easily switch views to make subcollection the primary focus instead of branches. The PivotTable made this as easy as changing a single option.

We could create similar reports for any activity captured with the "All Activity" report generated at the start of this endeavor. We could do this for any type of report that lists its data in column form. Here are the key things to remember:

- You must account for any possible value/label in the left-most column of the Millennium-generated report. Buried within character-based "MANAGEMENT Information → INFORMATION about the system → CODES used" menu lie all such tables, which are generally more complete than the information that would display via any of the "Admin" menu options in any given Millennium module.
- All data being summarized can be placed in a table using VLOOKUP functions that can pull these data points in from another source (be they external files or other worksheets in the same workbook).
- You must account for data not available when VLOOKUP references any given table by using the ISERROR function, placing it within an IF function call using the following natural language syntax: "IF VLOOKUP return an error, keep the cell blank. Otherwise, provide me with the value VLOOKUP finds".
- When creating your own subcategories, labels must be identical between codes you wish to combine. This includes use of trailing spaces, as necessary. You must also be mindful of the relationship between the data being analyzed and the labels used to translate them using VLOOKUP.

Close all files. It is not necessary to save changes.

Creating a table of checkouts by PTYPE

In our previous exercise, I noted that it was possible for Millennium to provide us with a report based on branches. This is possible because, in our system configuration, we can use the "Locations Served" table to group various location codes together and can create reports in that way.

We are not given this same flexibility with PTYPES, though—we can't group them together in the system. Many of us likely have implicit higher-level groupings of PTYPES that we use, with these higher-level groupings (such as branch or campus affiliations) usually reflected in the manner in which we'll group various PTYPES together when creating them.

Using the same tools we used in the last exercise, but on a different report from Web Management Statistics, we can create more meaningful reports on circulation statistics based on PTYPE.

The "All Activity" report generated for our last exercise cannot be sorted by PTYPE. We'll gather some new checkout reports.

(Re-)open up Web Management Reports' Web Browser interface.

On the left side of the screen, under "Circulation", click on "Circ Activity".

Provide an authorized set of credentials ("initials and password") if prompted.

Under "Circ Stats", click on "Checkout". Under "Dates", select "User spec". Under "Locations", select "System" (for all locations). Under "Type", select "PTYPE". Click on "Submit".

36 months of data are available, including the current month. Since we might be interested in constructing a month-to-month comparison, either with any given year or between years, data collection for this workshop has been performed at the monthly level, though it is possible to select any range of contiguous or non-contiguous months.

After selecting the month(s) desired, click on "Submit Query".

Refresh the screen (by clicking on "STATUS" as needed) until the report appears.

Save the report as a delimited text file by clicking on the "Download" icon near the top of the screen. Observe that this particular report does NOT use the PTYPE numeric value, but rather, its long name.

Save the file using methods appropriate for your browser of choice. Rename the file as desired, including a file extension of "txt", e.g. "PTYPE checkouts 200607.txt".

Generate all such reports and save them in a similar manner. Just as with the previous example, these reports need to be converted into Excel files so that the VLOOKUP function call can access them. These are also pipe-delimited files.

Open "PTYPE checkouts 200607.xls". All files have already been converted as needed. We'll open this one to allow us to point-and-click our way to it when invoking VLOOKUP.

From the character-based system, generate a list of all possible PTYPE values. This should be sent to the e-mail printer and imported into Excel. Note that when converting numeric PTYPE values that have leading zeros, these MUST be imported as text to preserve them. Though this particular example relies on the use of long names and not the numeric values, we will want to keep both in our table that will serve as our translation table.

Open "PTYPE table.xlsx". The file has already been prepared for you. Note the addition of two columns that we will use to combine similar PTYPES for reporting purposes—one based on affiliation, the other on level.

Resize the formula bar to be at least 4 lines long as was done in the previous exercise.

In cell E1, type "July 2006". Hit Enter, make E1 the active cell, and use the fill handle on E1 to enter the rest of the fiscal year months across the range of cells F1:P1.

Invoke the data call for the PTYPE/date combination in cell E2, remembering to account for the #N/A error that could be returned by VLOOKUP by using a combination of the ISERROR and IF functions. Because "PTYPE checkouts 200607.xls" is open, the function call for July will look like this:

=IF(ISERROR(VLOOKUP($B2,'[PTYPE checkouts 200607.xls]CkoutAllLocsbyPType200607'!$A:$C,3,FALSE)),"",VLOOKUP($B2,'[PTYPE checkouts 200607.xls]CkoutAllLocsbyPType200607'!$A:$C,3,FALSE))

If you prefer, open the file "PTYPE VLOOKUP functions.txt" in Notepad and copy/paste the first line into E2.

We use B2 as the VLOOKUP lookup_val because the long name appears in our Millennium-generated reports. We make the column reference absolute to allow us the opportunity to use the fill handle across the rest of the row.

Close "PTYPE checkouts 200607.xls". Again, this forces path information into our table_array argument.

With the July 2006 value pulled in (noting it may actually be a blank given our formula), make E2 the active cell and grab its fill handle, using that across the range of cells F2:P2.

Select each cell of F2 to P2 individually. In the formula bar of the active cell, change all yyyymm references in both file names AND worksheet names to the month listed in row 1 for all of the formulas. There will be four changes to make in each formula.

Provided all mmmmyy changes have been made correctly, row 2 should now look like this:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	PTYPI	PTYPE Label	Affiliation	Level	Jul-06	Aug-06	Sep-06	Oct-06	Nov-06	Dec-06	Jan-07	Feb-07	Mar-07	Apr-07	May-07	Jun-07
2	000	INVALID: SELEC	ERROR	ERROR		7	4	1	7		7		1	1		
3	001	KRAI Librarian	Ross School	Faculty												

Once all yyyymm changes have been made, highlight the range of cells E2:P2 (to select all twelve monthly formulas. Use the fill handle to complete calculations for all remaining PTYPES.

Open "PTYPE table with data.xlsx". All data is made available to you in this workbook without your having to make all of the date changes or populate other records.

Create the PivotTable on a new worksheet, ensuring the range of cells is A1:P49. "Affiliation" and/or "Level" go into the "Rows" area. All months go into "Values". Note that all months will need to be changed from "Count" to "Sum" via "Value Field Settings" or the context menu "Summarize Data By…" option.

Set your desired design in the context-specific Design tab.

Change the order of display of affiliation to list Ross first by right-clicking on the "Ross School" affiliation, selecting "Move", then choosing "Move 'Ross School' to Beginning". Selecting a "Level" will move that (across all higher levels) instead of moving the desired affiliation.

Close all files. It is not necessary to save changes.

Working with Web Access Management statistics

Our next Excel foray today takes us to the world of Web Access Management (WAM) statistics. Innovative already provides us with a well-functioning (macro-driven) workbook that creates spreadsheet reports based on the various reports that can be created using Millennium Web Reports. This Excel workbook can be found at http://csdirect.iii.com/downloads/#wam. With just a little bit of effort, we can make these reports even more useful.

Getting the data out of Millennium

WAM statistics can be retrieved using the Web Management Reports' Web Browser interface. You must be authorized for function 017 (Circulation statistics) to gather this data.

MGR #105428 provides instruction on how to download the data.

Open up Web Management Reports' Web Browser interface.

On the left side of the screen, under "User Access", click on "Web Access".

Provide an authorized set of credentials ("initials and password") when prompted.

Select the type of report desired in step 1. Note that, despite the organization of the screen, any of the options in step 1. are mutually exclusive. Radio buttons, not checkboxes, are found here, and even though the reports are organized into three overall categories, you can only pick a single report to generate at one time. It is not possible to select a single report from each of the three categories

Select the databases for the report in step 2. Use standard Windows key strokes in conjunctions with the mouse to select contiguous (Shift) or non-contiguous (Ctrl) databases from the list.

Select the date range in step 3. Many standard date options are listed. If your date selection precedes available data, your data will start with the first data points available.

Click on the appropriate button to start report generation in step 4. You may find it better to download, then delete (instead of "download and delete") to make sure the report is complete. If you're interested in generating more than one type of report (as listed in step 1.), you must be sure to generate all desired reports before deleting the statistics.

Save the reports as generated.

Creating reports

Using the workbook Innovative provides, specify the locations for each of the reports you want to create, based on the downloaded data files collected.

Click on the folder icon next to any report name to set the path and file name to import.

To generate any given report individually after setting the path, click on the button with the report name.

To generate a series of reports simultaneously, set all paths as necessary and click on "Generate All Reports".

Be sure to click on "Save Data File Settings" if you are interested in saving the path information as currently configured.

The "Web Access Management Report Tool" dialog box can be dismissed by clicking on its "x" in the upper right corner.

Each report will reside on its own worksheet. Note that even reports that were not generated still keep their worksheets, so you may find it useful to delete these extraneous worksheets after you've finished with report generation.

Working with reports

Open "WAM FY 2008 hour by date.xlsx". Welcome to one year's worth of the Kresge Library's "hour by date" WAM statistics. It is noted that all of this data was not captured at the same time; rather, statistics are gathered and files cleared every two months. The file you are looking at is thus a compilation of 6 bimonthly files.

A single extra column has already been added: Day of the week. How does usage vary across days of the week?

Create a PivotTable (range of cells: A1:Z361). Place "Day of Week" in the "Column" area and all of the various times in the "Values" area (selecting the checkbox in the "Field List" should correctly add them to the "Values" area).

As necessary, move the "∑ Values" button to the "Row" area. Note how, since all of our cells are defined, Excel assumes we want to add them and automatically provides us with the sum.

In B29, use SUM to add B5:B28. Use the fill handle to calculate totals for all other days. On Sundays in FY 2008, WAM served up 2,728,933 files. We see that Tuesday was the highest traffic day (4,130,448 files served in FY 2008) and Saturdays the lowest (2,188,813).

On average, how many files were served up on Wednesdays between noon and 1 PM? *Right-click on any "Sum of 12 Noon" value to bring up a context menu. Select "Summarize data by", then "Average" from the submenu.* On average, 5,129 files were served up every Wednesday during FY 2008 from noon to 1 PM.

Change the Field Setting back to "Sum" ("Undo" will work well for this).

Let's take this up a notch.

First, remove the Day of the Week sums in row 29.

Remove "Day of Week" from the PivotTable altogether. Move the "∑ Values" button from the "Row" to the "Column" area. Add "Date" to the "Row" area.

All we've really done now is re-create our original data table. But it is now in a PivotTable format and things not possible before now are!

Right-click on any cell in column A. In the context menu, select "Group". In the "Grouping" dialog box, select only "Months" by ensuring that is the only highlighted label in the "By" area. Click on "OK".

This is nice, but it scrolls off the screen. Move "Date" to the "Column" area and "∑ Values" back to the "Row" area. In January 2008, 85,923 files were served up by WAM between midnight and 1 AM. There are still some issues here, though.

We know our data is from FY 2008. How are others to know? Additionally, the way the data is arranged makes it seem like all months are from the same calendar year, which we know not to be true. *Right click on any of the month labels in row 4 (in our last exercise, they were in column A). Select "Group" from the context menu. Keeping "Months" highlighted, now also select "Years" and click "OK".* Now, the months are in the order we want them to be, and they're labeled with years.

Depending on how your "Subtotal" options are configured, you may see subtotals by year. *To switch between displaying these totals, go to the context-specific "Design" tab and select one of the options under "Subtotals" in the "Layout" group.*

We can take our chronological breakdown one step further. *Yet again, right click on any of the month labels in row 4. Select "Group" from the context menu. Keeping "Months" and "Years" highlighted, now also select "Quarters" and click "OK".*

If you've elected to display subtotals, this layout might be a bit confusing! *Keeping the order that they're in, switch the fields in the "Column" and "Row" areas with each other.*

Let's take a look at one more thing here.

Remove "Year" and "Quarter" from the PivotTable (you should only have groupings by months remaining). *Switch the fields in "Row" and "Column". Add "Day of Week" to "Row", placing it under "∑ Values".* In January 2008, 8,624 files were served up by WAM on Sunday during the hour of midnight to 1 AM.

At the bottom of the table, grand totals by hour might be displaying. *From the context-specific "Design" tab for PivotTables, select "Grand Totals" from the "Layout" group and select options for totaling for rows and columns.*

Every single one of these number could be cherry-picked from the massive table of hour-by-date WAM statistics. Look, however, at the flexibility and speed that using PivotTables provided us when putting everything together!

Using conditional formatting

The ability to glance at any given spreadsheet and determine trends or points of interest in an important one. Conditional formatting is one tool Excel provides us with that can help us with this ability. Limited to three conditional formatting elements as recently as Excel 2003, Excel 2007 allows us to do many interesting things.

In "WAM FY 2008 hour by date.xlsx", select the worksheet "FY 2008 hour by date"..

This is a sea of data if there ever was one! Aside from seeing where the zeros are, we'd be hard-pressed to easily identify anything in this mass of numbers. Let's add some conditional formatting to help draw our eye to trends by creating a color-graded scheme to reflect times of low activity (no shading) to high activity (red shading), using intermediary shades of yellow and orange. Excel 2007 makes this easy!

Select the range of cells B2:Y361. From the Home ribbon, "Styles" group, select "Conditional Formatting", then "Color Scales". From the "Color Scales menu, select "More Rules".

We can leave the "Select a Rule Type" area unchanged. In the "Edit the Rule Description" area, select a "3-color scale".

- *Set all three "Type" settings to "Percentile"*
- *Enter the values "2", "50", and "98" (from left to right)*
- *Associate the color white with the 2nd percentile, yellow with the 50th, and red with the 98th percentile.*
- *Click "OK".*

Now, with a simple glance, it is easy for us to spot trends in usage and excessively high or low demand times, such as inter-semester breaks, finals and midterms, and even weekends. There are all sorts of options here for you to select and play around with—when working with your own data, be sure to set options that accentuate the highs and the lows you are trying to bring out.

Conditional formatting can also be useful for working with detailed financial reports created with PivotTable data, allowing you to draw your eye immediately to funds that are in need of further investigation.

Open "Cond Fmt DFR.xlsx", which already has the conditional formatting in place for free and cash balances according to the following rules:
- If free or cash balance for any fund is less than 50% spent relative to its appropriation, don't change the background color.
- If the fund is between 50 and 75% spent relative to its appropriation, make the background color yellow.
- If the fund is between 75 and 100% spent relative to its appropriation, make the background color orange.
- If the fund is overspent, make the background color red.

From the "Home" ribbon, "Styles" group, click on "Conditional Formatting" and select "Manage Rules". Note the rules in place, and how they can be applied to ranges of cells all at once instead of using the fill handle—an improvement over Excel 2003.

Close all files. It is not necessary to save changes.

Creating and customizing charts

We're done creating tables and performing data analysis. We'll now focus our attention on creating charts based on our data.

Excel 2007 provides a significant improvement in the charting experience over earlier versions of Excel. While tools such as the Chart Wizard and double-clicking for formatting menus have disappeared, the overall chart creation and customization experience is now streamlined.

Creating a chart in Excel takes three simple steps:
1. Select the data (including column headers, if present)
2. Open the "Insert" ribbon by clicking on the "Insert" tab, then click on "Chart" in the "Charts" group
3. Select a chart type

Voila! A chart! Many times, it's not exactly what we want, but it *is* a start and a vast improvement over anything we'd be able to create in any traditional medium.

Charting a single series

Let's create a basic bar chart based on total circulations.

Open the workbook "Charting Circ.xlsx". This workbook brings back one of our exercises from earlier in the day, with the PivotTable already completed.

Make the active cell anywhere in the PivotTable. Hit F11 to create a new chart on a separate worksheet.

Whoa! Ugly! Useless! Since we invoked the charting command from within a PivotTable, Excel created a PivotChart. Based on the simple chart we're trying to create, we need to copy the contents of the PivotTable and place them elsewhere for use with Excel's regular charting features.

Delete the PivotChart (and quickly!).

Copy Sheet1 (the worksheet where the PivotTable resides) in its entirety. Create a new worksheet. From the "Home" ribbon, "Clipboard" group, use "Paste Values" from the "Paste" dropdown to paste the values but not their underlying PivotTable format.

By clicking in the row header, select all of row 25 (Grand Total). Hit F11. Congratulations. You've made a chart! Upon further examination, though, some things need to be corrected:
- There's an empty data point (called "1")
- What unit is on the x-axis? Right now, it's simply an ordinal count.
- The smallest discernable unit on the y-axis is 500, making it visually difficult to discern finer levels of detail

Let's address these in order:

In the context-specific "Design" ribbon, "Data" group, click on "Select Data". In the "Select Data Source" dialog box that appears, change "Chart data range" to cover the range of cells C25:N25 from the appropriate worksheet. This can be done via point-and click.

Still in the "Select Data Source" dialog box, change the legend entry by clicking on "Edit" under "Legend Entries". Provide a meaningful series name, such as "Total circulation, all branches". Click "OK" to dismiss the "Edit Series" dialog box.

Click on "Edit" under "Horizontal (Category) Axis Labels". Once in the dialog box, point-and-click your way to the range of cells C4:N4, which contain the "Sum of..." labels. Click "OK" to accept changes.

Click on "OK" to dismiss the "Select Data Source" dialog box.

Go to the context-specific "Layout" ribbon. In the "Axes" group, lick on "Gridlines", then "Primary Horizontal Gridlines". Select "Major and Minor Gridlines" from the submenu.

We've addressed our concerns. Let's make this a little snazzier looking, though.

From the "Design" ribbon, "Type" group, click on "Change Chart Type". Make it a 3-D column chart. Click "OK".

Remove the legend by returning to the "Layout" ribbon, "Labels" group, clicking on "Legend", and selecting "None".

Remove the depth (Z) axis label (since we only have one dimension, and that dimension's description is captured in our chart title) by clicking on "Axes" in the "Axes" group, selecting "Depth Axis", then "None".

Lastly, let's turn on display of data labels by clicking on "Data Labels" in the "Labels" group and selecting "Show". Want to change font properties? *With the data labels still selected, right-click for a context menu, making changes as you see fit. You can also move single data labels by single clicking on them (look for the four-headed "move" cursor.)* Ooh! Fancy!

Change the chart type again, to a Line chart, or a Line chart with markers (to bring data points to the foreground). Your options are virtually limitless. Unlike earlier version of Excel, it is no longer possible to change a data point by making a change to a chart. Thus, consider a chart to work much like a PivotTable—it is not possible to harm underlying data simply by manipulating chart views.

The biggest problem we face with charts is that, generally speaking, we only want to chart a small portion of our data sets. As with our first charting exercise, this will require us to make some changes once the data is actually in a chart form, but nothing that is too extreme nor difficult.

Excel will base a PivotChart off of the PivotTable when we inform Excel we want to create a chart from within the PivotTable. Since PivotTables and PivotCharts are intrinsically linked (what happens in one automatically affects the other), the best way to break this link is to copy the table and "Paste Values".

Charting multiple series

In our next example, we'll graph the subcollections (across all non-MeLCat branches), initially creating a "100% stacked" chart. We'll return to our PivotTable (used in the previous example), configure it to display only items of interest, and undertake steps similar to our first charting exercise.

Go back to the PivotTable on" Sheet1" of "Charting Circ.xlsx". Configure the PivotTable so that "Subcoll" is the only "Row" item. Change the "Subcoll" display such that only "Electronic", "Periodicals", "Reference", "Reserves" and "Stacks" are showing.

Invoke a PivotChart from the PivotTable and place the chart on its own worksheet by hitting F11.

More ugliness—not to mention this isn't the chart type we want! But here, there's hope. Since there are no extraneous data elements displaying in our PivotTable, we *might* get a better view by switching things around some, saving us the step of copy/pasting.

From the "Design" ribbon, change the chart type to one of the "100% stacked" ones. This is alright, but notice that our categories are based on subcollection, not date. Switching the "Row" and "Column" areas of our PivotTable should address that.

Go back to Sheet1. Call up the "Field List". Swap the locations of the "∑ Values" and "Subcoll" buttons. Return to the chart. This is what we're after.

Add minor horizontal gridlines (Layout → Gridlines → Primary Horizontal Gridlines → Major & Minor Gridlines)

Change the chart type to the "3-D column" chart. In this chart, each subcollection is placed on its own along the z (depth) axis. Note that data points with a value of "0" still display here…only a mouseover for the specific data point or a display of the data table will reveal this fact. Also note that, because this chart is tied to a PivotTable, if we want to rearrange series order, we must do so via the "Move" context menu option, invoked from the PivotTable.

We're more interested in just Reserves and Stacks circulations. Let's just account for those. *In the PivotTable, select the "Subcoll" dropdown and clear all checkboxes except those for "Reserves" and "Stacks". Return to the PivotChart.* Note how our PivotChart has changed.

Add a title to your chart by going to the "Layout" ribbon.

Close all files. It is not necessary to save your work..

Fun with pie charts

Our last example with charting takes us back to fund activity data so we can look at pie charts.

Open "Charting FAR.xlsx". This is our earlier FAR spreadsheet with PivotTables created by selector and discipline. We're interested in examining expenditures by selector for accounts that have a single selector assigned. Let's set up our PivotTable to get only the data we want.

In the "Selector" PivotTable, remove "Appro" and "Enc" from the "Values" area.

If we keep the secondary breakdown by fund code, those will all be included, too. *Remove "Fund Code" from the "Rows" area.*

Lastly, there's that pesky "Any"—funds that any selector can use. Let's remove that. *Click on the dropdown in A3 and clear the checkbox for "Any".*

Now we're set. *Hit F11 to create a new PivotChart on a separate worksheet.*

From the "Design" tab, change the chart type to a pie chart. Select one of the options in "Chart Layouts" to display selector and dollar amount.

Pie charts (and their first cousins in Excel, doughnut charts) have a decidedly limited appeal, the options available for them aren't nearly as flashy or expansive as they are with other chart types, and on more occasions than not, they're not very useful. But, since that is one of but two charting choices we are provided with via the Millennium interface, it was worth exploring with the one dataset that my library produces that would make for a remotely interesting graphic.

Close all files. It is not necessary to save your work.

Dynamic object embedding and linking

Our class ends with a subject that literally brings it all together!

As an integrated suite of productivity software, Office 2007 provides us with a number of features through which we can incorporate elements from one application into another. Using this ability, we can incorporate a portion of an Excel worksheet into a Word document, for example. These tools allow us to work within the oft-discussed (but yet to be fully-realized) concept of the paperless office, for without this sort of integration, we'd be forced to print both files and either awkwardly interfile them or simply include one of them as an attachment, removing it from context. With this integration, we can simply prepare a single file that incorporates elements of both file types, keeping relevant information within the context it's used. Incorporating Excel worksheets as **objects** into a Word document will allow you to work with both files in their native context—something not possible if content is simply "copied and pasted". In this context, the Excel workbook containing the object worksheet is considered a **source file**.

It is possible to insert an entire Excel workbook as an object, but only a single worksheet from that workbook will display in Word. To display a different worksheet, double-click on the Excel object and select the worksheet you want.

Office actually provides us with two types of this integration ability:
- In the first, called **embedding**, the information in the inserted object is static relative to its source. that is, even if the workbook that the object came from is updated, the portion embedded into Word will **not** be. Once inserted into the document, they become a part of it and are no longer linked to the source file.
- In the second, called **linking**, the information in the inserted object is actively linked to its source. By default, linked objects are automatically updated when the file referencing them is opened. This behavior can be altered using the Office Button's series of "Prepare" commands.

Consider using *embedding* when you don't want the information to reflect any changes made to the source file or when you don't want recipients of the Word document to be concerned with updating the link information.
Consider using *linking* when you're maintaining an Excel workbook independently of the Word document, or if the file size of the Excel workbook is a consideration.

Let's see some of this in practice. First on the list, an area of cells simply copied and pasted from Excel into Word.

Open the Word document "OLE Word examples.docx".

Examine the Excel information on the first page.

You'll notice that you can change cell widths and heights, and can even click on cells and change/format their contents. But while doing so, you're working within Word and not Excel, where the data was originally compiled (in this case, via a PivotTable, where clicking on a cell's contents drills down into the data that comprises it). Also note that, when you make changes to cells, other cells that reference the changed cell are not automatically updated—a native characteristic of Excel. All copy and pasting has done in this instance is placed pretty text within Word that can be changed at will, just like anything else.

Examine the Excel information on the second page of "OLE Word examples.docx".

Here, the Excel object is embedded. Notice the difference in appearance from the data that was simply copy-and-pasted. Our Row headers have selection buttons, as do labels for "Branch" to allow for collapsing and expansion.

Double-click anywhere in the Excel object.

It may take awhile (especially here, with the 4,560 cell references from 12 other workbooks that need to be gathered), but eventually our pasted cell range will look like it would in Excel, with row and column headers and the various worksheet tabs at the bottom.

Look at the ribbon options available to you. We are looking at ribbon options as they exist in Excel, not Word (including, in this instance, the contextual tool sets for PivotTables. Anything you could do to this workbook in Excel you can do here (even though, as the title bar says, we are in Word). As an embedded object, though we are now able to work with this data in Excel, we are making changes independent to that of the source file. The two are not linked in any way, and any changes made to the source file will not be reflected in this embedded object.

Click outside of the Excel object to close Excel and return to Word. Whatever area of your workbook was displaying when you clicked outside of the Excel object to return to Word will be the area that is now displaying in your Word document.

Creating an embedded or linked object is easy!

Open both of the files "OLE Student Excel.xlsx" and "OLE Student Word.docx".

In the Word document, place the cursor on a blank line.

Go to the Excel workbook. Select, then copy, the range of cells A1:C10.

Back in Word, from the "Home" ribbon, click on the dropdown arrow under "Paste" in the "Clipboard" group. Select "Paste Special".

The "Paste Special" dialog box appears. Be sure to select "Microsoft Office Excel Worksheet Object" on the right side of the box.
- *If you want to **embed**, select the **Paste** radio button*
- *If you want to **link**, select the **Paste link** radio button (Select this option for this exercise)*
Click "OK" to dismiss the "Paste Special" dialog box.

 Save the Word document and close it.

Add something new in the range of cells A1:C10 in "OLE Student Excel.xlsx".

Save and close the Excel workbook.

Re-open "OLE Student Word.xlsx". Click "Yes" to update the document. Your changes appear!

It is also possible to force a refresh at any time using the context menu "Update Link" option.

Dynamic object embedding and linking also allows you to incorporate Excel worksheets into PowerPoint presentations, using the exact same command sequence as in Word (only performed in PowerPoint).

Start up PowerPoint.

Open "OLE for PowerPoint.xlsx". Click to select the "Plot Area" of the chart. When successful, a large rectangle will surround the chart (including the legend) but not the chart title. Copy the selected area.

In PowerPoint, insert a new blank slide via the "New Slide" option in the "Slides" group. With that slide selected, from the "Home" ribbon, click on the dropdown arrow under "Paste" in the "Clipboard" group. Select "Paste Special"

The "Paste Special" dialog box appears. Now working with an Excel chart, be sure to select "Microsoft Office Graphic Object" on the right side of the box.
- *If you want to **embed**, select the **Paste** radio button*
- *If you want to **link**, select the **Paste link** radio button (Select this option for this exercise)*

Click "OK" to dismiss the "Paste Special" dialog box.

Hit Shift-F5 to see how this looks in PowerPoint's presentation mode.
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Excel References

The following books are all highly recommend. Each of them factored, in one way or another, into the content created for this class. Though the Dalgleish book I referenced was written for Excel 2003, she has written a new version for 2007, along with an introductory PivotTable book.

Dalgleish, Debra. Excel Pivot Tables Recipe Book. Berkeley: Apress, 2006.

Stinson, Craig, and Mark Dodge. Microsoft Office Excel 2007 Inside Out. Redmond: Microsoft, 2007.

Walkenbach, John. Excel 2007 Charts. Indianapolis: Wiley, 2007.