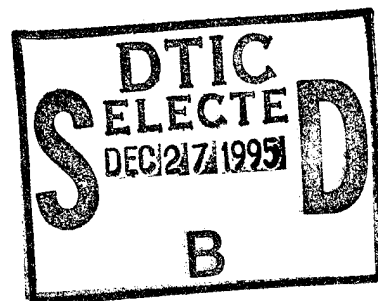


# NAVAL POSTGRADUATE SCHOOL MONTEREY, CALIFORNIA



## THESIS

**FINANCIAL MANAGEMENT INFORMATION  
SYSTEMS: THE USE OF ELECTRONIC  
SPREADSHEETS IN BUDGETING**

by

David K. Morris

June, 1995

Thesis Advisor:

Jerry L. McCaffery

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OF ELECTRONIC SPREADSHEETS IN BUDGETING**

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Submitted in partial fulfillment  
of the requirements for the degree of

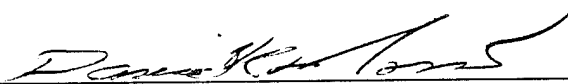
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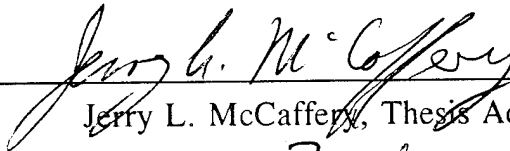
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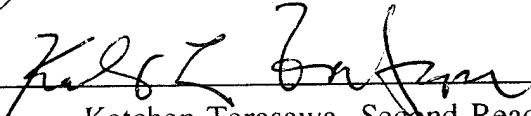


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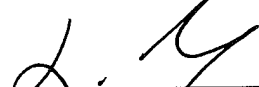
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## ABSTRACT

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## I. INTRODUCTION

### A. DISCUSSION

#### 1. Budgeting in Business

Budgeting is not unique to the Navy, the Department of Defense (DoD), or the federal government. From large international corporations to small local "mom and pop" stores, budgeting is a vital aspect of running a business organization. A successful business must be able to develop a budget, and operate in accordance with it. The primary tool used in business to develop budgets is electronic spreadsheets. Spreadsheets provide an easy-to-use computer-based system that can help create, evaluate, and monitor budgets.

The use of spreadsheets in business has been so successful and popular, many business schools now include the use of spreadsheets in their curriculums. Additionally, the success of spreadsheets in business budgeting has spilled over into the home, with the popularity of Lotus 1-2-3, Microsoft Excel, and personal financial planning and budgeting spreadsheet software such as Quicken.

#### 2. Navy Budgeting

The Department of the Navy's annual budget for fiscal year 1995 was \$xxx billion. The process through which the Navy receives this funding is called the Planning, Programming and Budgeting System (PPBS). The purpose of the PPBS is to establish the most effective allocation of resources to accomplish our national defense

objectives. As with all budgets, the Navy's challenge is to choose, among all the alternative programs, where to spend its limited funds.

There are three phases of the Planning, Programming and Budgeting System. The first phase is planning, in which the global threat is assessed and a strategy to meet the threat is defined. The planning function is carried out by high level military officials in the Pentagon and the White House. Their goal is to ensure that our country's defense needs are provided.

The second phase, programming, translates the strategic plans into personnel, material, and dollars needed to counter the defined threat. The Navy systematically projects military force needs over the next eight years, and funding needs for the next six years.

The third phase is budgeting, which expresses the programs in terms of biennial funding requirements. A budget is a planned program for a fiscal period in terms of estimated cost, obligations, and expenditures. It is a plan for accomplishing an organization's objectives through the management of its resources. The Navy budget is an instrument of planning, decision-making and management control.

Initial budget preparation begins at the work center level of a field activity. Personnel who actually perform the work are relied upon to provide the best estimate of the amount of resources required to complete a given job. Work centers prepare and submit operating budget estimates to their responsibility centers, for example, shore stations. After analysis, review, and adjustment, the

budgets are sent up to the next higher level, where they receive another round of analysis and review. The budget estimates are collected, scrutinized and compiled at each ascending level of command until they reach the Assistant Secretary of the Navy/Comptroller, where they become part of the Navy budget. The review process up and down the chain of command within the Navy provides a system of checks and balances that makes sure that the Navy's budget is the most defensible and executable possible.

Once the budget formulation and review process is completed and funding has been appropriated, apportioned, allocated, and distributed, the process of budget execution begins. Budget execution involves a complex set of procedures to control and evaluate the expenditure of funds to ensure they are used in the manner agreed to during the PPBS process, and in accordance with the laws and regulations regarding the proper use of taxpayer money.

The daunting responsibility of managing the Navy's budget, through the PPBS process and through budget execution, rests with the Navy Comptroller, and the comptrollers and financial managers at every level in the chain of command. During the budget formulation and review process, they are responsible for the collecting and analyzing of budget estimates. They issue and process Budget Calls. They submit exhibits to support budget estimates. And, they defend their budget estimates before higher levels in the chain of command and before Congress. During the budget execution

phase, financial management personnel ensure that: money is spent for the purpose for which it was appropriated; no more money is spent than was appropriated; and that the money is spent effectively and efficiently.

Within the comptroller's office, at any level, there are accounting personnel and budgeting personnel. It is the budget personnel who are the key players in both the budget formulation and execution processes. Budget analysts track, review, analyze, and control the budget. They provide progress reports on budget performance in relation to their objectives. These reports provide valuable information to managers. Budget analysts identify potential problem areas and are able to spot trends during budget execution.

In an era of military downsizing, budget deficits and a staggering national debt, the Navy must ensure that every taxpayer dollar it receives is spent wisely. As the Navy gets smaller, its commitments do not; in fact, they continue to increase. The Navy must get the most "bang for the buck" in its budget. Through intensive budget review and analysis, it can minimize financial risk and public concern. The Navy must be able to justify to Congress every dollar requested, for it is competing for an ever-decreasing funding supply. If a budget cannot be defended or cannot be executed as planned, funding becomes vulnerable to others who can show a need for it.

## **B. PURPOSE OF RESEARCH**

The primary purposes of this thesis are: to examine the extent of electronic spreadsheet software usage in Navy budgeting; to discuss who is using electronic spreadsheets and how they are being used; and, to evaluate the adequacy of spreadsheet training in the Financial Management Curriculum at the Naval Postgraduate School.

## **C. SCOPE OF RESEARCH**

The thesis will provide information as to the level of electronic spreadsheet usage in the budgeting arena of financial management in the Navy, and the level of electronic spreadsheet training at the Naval Postgraduate School. The following additional research questions will be addressed:

- What is the history of Management Information Systems?
- How do the various budget levels within the Navy use spreadsheets?
- What level of exposure to spreadsheets do Financial Management students receive at the Naval Postgraduate School?
- Is the level of exposure to spreadsheets at the Naval Postgraduate School adequate for Financial Management students?
- What level of spreadsheet exposure/proficiency do other graduate business schools provide/expect from their students?

#### D. RESEARCH APPROACH

The research for this thesis was conducted in two phases. The first phase was to conduct a thorough review of pertinent publications to provide background information on Management Information Systems, and on the Department of the Navy's Comptroller organization and budgeting processes.

The second phase consisted of interviewing personnel from several organizations to address the research questions. Information was obtained via interviews within the following organizations:

- Commander, Naval Air Station, Lemoore, CA
- Commander, Naval Air Station, Miramar, CA
- Commander, Naval Air Forces, U. S. Pacific Fleet (COMNAVAIRPAC)
- Commander, Naval Surface Force, U. S. Pacific Fleet (COMNAVSURFPAC)
- Commander in Chief, U. S. Pacific Fleet (CinCPACFLT)
- Office of the Navy Comptroller (NAVCOMPT)
- Naval Postgraduate School
- University of Pennsylvania
- University of Wisconsin - Madison
- Stanford University
- University of California - Berkeley

## **E. THESIS FORMAT**

The structure of this thesis consists of Chapters I through V and Appendix A. The first chapter is the introduction. The second chapter provides background information on Financial Management Information Systems and on the Navy comptroller organization. The third chapter describes the various spreadsheets and their uses at different comptroller organizations. The fourth chapter deals with the adequacy of spreadsheet training at the Naval Postgraduate School. The last chapter contains conclusions and recommendations.



## II. FINANCIAL MANAGEMENT INFORMATION SYSTEMS

### A. INTRODUCTION

The Navy's primary responsibility is:

To organize, train, and equip Navy...forces for the conduct of prompt and sustained combat operations at sea, including operation of sea-based aircraft and land-based naval air components--specifically, forces to seek out and destroy enemy naval forces and to suppress enemy sea commerce, to gain and maintain general naval supremacy, to control vital sea areas and to protect vital sea lines of communication, to establish and maintain local superiority (including air) in an area of naval operations, to seize and defend advanced naval bases, and to conduct such land and air operations as may be essential to the prosecution of a naval campaign. [Ref. 1, p. 2-2]

Resource management responsibility is an important task which involves every part of the Navy organization. Without effective resource management, the mission would not be accomplished.

The Navy, as do all organizations, needs to be able to process data and use information effectively. Enormous amounts of information are used in planning, controlling, budgeting, organizing, and decision making. The advent of computers significantly improved the Navy's ability to process vast amounts of information. The Navy was a leader in the development and use of computer technology, and it has developed standard software programs that are used throughout the Department of the Navy in a variety of

functions. In the financial arena, STARS and UADPS are probably the most widely used programs. In recent years, the proliferation of small desk-top personal computers (PCs) and the development of user-friendly spreadsheet and database software have enabled users to create independent ad hoc programs anywhere, anytime.

This chapter will look at Financial Management Information Systems (FMIS) and the role PC-based software could play in Defense resource policy and management. I will provide an overview of the Department of Defense (DoD) and DoN financial management organizations, specifically, from the Office of the Comptroller down to the comptrollerships at Naval Air Stations. This overview will help illustrate the kind of information and the importance of the information required in Defense resource management. I will then discuss the evolution of Management Information Systems, from simple automated data processing to executive information systems. I will focus on desk-top PCs and off-the-shelf end-user software. Finally, I will discuss how the financial information needs of the comptroller organizations might be satisfied by using PC-based spreadsheet software such as Lotus 1-2-3 or Microsoft Excel.

## **B. FINANCIAL MANAGEMENT ORGANIZATIONS**

Financial management within the DoD and the DoN is the responsibility of the Office of the Comptroller. At the DoD level, the Office of the Comptroller is a functional area of the Office of the Secretary of Defense (OSD), which provides guidance to the service components in the performance of the Secretary of Defense's

programming, budgeting, and fiscal functions. It is also responsible for the design and installation of resource management systems throughout the DoD. Resource management information is collected, analyzed, and reported for the Office of Management and Budget, the Congress, the General Accounting Office, and other agencies outside the DoD. The DoD Comptroller's most visible role is that of supervising, reviewing, and providing direction in the preparation and execution of the Defense budget.

At the Navy level, the Assistant Secretary of the Navy for Financial Management, ASN(FM), is a civilian. He is dual-hatted, also serving as the Navy Comptroller. The Navy Comptroller's Office (NAVCOMPT) is responsible for the financial management of the Navy, including budgeting, accounting, disbursing, financing, internal review, and progress and statistical reporting.

Comptrollers work in commands throughout the Navy. They can be found at large Systems commands, within the CinC and TYCOM organizations, at shipyards, supply centers, naval bases and naval air stations. The comptroller's job is to be the financial manager of the command or activity. Comptroller responsibilities include:

- Providing technical guidance and direction in financial management throughout the local organization
- Maintaining a classification of the programs administered, their objectives, and a current inventory of budget plans and program schedules

- Formulating, reviewing and executing local budgets
- Collecting obligation, expenditure, cost, and other accounting and operating data
- Reviewing program performance against the financial plan
- Promoting economy and efficiency in the performance of assigned programs
- Ensuring compliance with relevant laws and regulations (including appropriation laws)
- Proposing the reallocation of resources
- Defending budget requests before higher levels

Comptrollers, operating in a staff capacity, report directly to the commanding officer. They are part of the commander's top management team, providing him with factual data needed for effective management of operations and advice on financial management matters. The comptroller has a responsibility for interpreting program and fiscal data, and acting as a technical adviser to the commander on financial issues. He must be responsive to the needs of management and must anticipate the future requirements of current programs. It should be noted, since comptrollers are staff positions, they make recommendations to management; they do not make management decisions.

Within each comptroller organization there are two basic functional areas: Budget Formulation and Execution, and Accounting. Financial management personnel who work in budget formulation and execution have many common tasks. They:

- Formulate and submit budget estimates in support of program objectives and priorities.
- Review and analyze budget submissions.
- Present and justify budget requests before higher level authorities.
- Develop an operating plan for allocation of funds to user programs.
- Monitor the execution of programs to ensure maximum obligation and expenditure of funds.
- Review and analyze funding documents to ensure that accounts are appropriately funded and charged accordingly.
- Conduct comparative analyses to examine and explain trends and problems affecting budget planning and execution.
- Review budget policies, regulations, and statutes to ensure compliance.
- Monitor proposed and pending legislation and national policy to keep informed of key issues.

- Interpret and write guidance and instructions to ensure that policies and procedures are followed correctly.
- Perform administrative functions in accordance with organizational requirements and objectives.

The role of financial management personnel on the budget formulation and execution side of the comptroller organization can be likened to that of a managerial accountant. Managerial accountants deal mostly with financial data for planning, control, performance analysis, and decision making; they are forward-looking, and are concerned with how to improve future performance.

Financial management personnel who work on the accounting side of the house in the comptroller's shop are concerned with the more traditional aspects of accounting: that is, "the science of recording, classifying, and summarizing (reporting), in a significant manner and in terms of money, transactions and events which are, in part at least, of a financial character, and interpreting the results thereof." [Ref 2, p. 2-1] It should be noted that governmental accounting deals with appropriated funds, which by their nature require the use of modified financial accounting procedures. It should be kept in mind, however, that accounting systems, whether public or private, should provide useful data in an accurate and timely manner. Accounting is a tool, a method of communicating financial facts concerning an activity to those who have an interest in interpreting and using those facts for financial decision making.

### C. PROBLEM

Accountants collect and process raw financial data, in effect developing a historical record. The budget personnel analyze the historical record in order to project the future so they can plan for it or attempt to change it. Where accounting is a science, budgeting is an art. The most efficient and cost effective situation would be where Accounting provides to the Budget shop the exact information desired, in the format desired, when desired. The budgeteers could then quickly and easily analyze the data and make accurate projections and plans. In reality, this does not happen and probably never will.

Accountants collect financial data in a number of formats, on a number of systems, and not always in a timely and accurate manner. Additionally, what data is collected is not always available when needed (due to standardized report generation scheduling, lengthy processing time, high user demands, etc.). Once Budget personnel obtain the raw data from Accounting, it is time to analyze and study the information. The budgeteers need to be able to perform a variety of operations on the data in order to turn that raw data into relevant management information that can be used for financial decision making. Historically, Budget analysts would gather large amounts of data and request the computer/ADP department to run the data on their large mainframe computers to produce a regression analysis, variance analysis, or do some other "number crunching" drill. Again, because of the demand placed on mainframe computers,

turnaround time for a request was slow and repetitive drills were frowned upon. A budget analyst requires the ability to do numerous what-if drills to project more accurately future outcomes.

If a manager doesn't have the right information at the right time, he/she cannot fulfill his/her responsibilities effectively. Information must be *that which* a manager needs for a *particular* decision-making process that he is undergoing. If the information is received without adequate time for the manager to take advantage of the situation, or to correct a possible problem, then it is worthless.

#### D. MANAGEMENT INFORMATION SYSTEMS

The history of computer-based information systems is a relatively short one, encompassing only the last 45 to 50 years. However, the advances made in this short time span have been remarkable. From very simple transaction processing systems (TPS) in the 1950's, to the comprehensive Expert Systems (ES) of today, it is hard to imagine what form information systems will take in the next 50 years and what fundamental changes will occur.

During the 1950's and 1960's, information systems were very simple: transaction processing, record keeping, and traditional accounting applications. Transaction processing systems would record and process data generated from business transactions. For example, at a bank, a customer makes a withdrawal from his savings account. At the end of the business day, all of the customer transactions for that day would be processed. The TPS would record the customer's withdrawal, reduce the customer's savings balance by

the given amount, and reduce the bank's cash balance by the same amount. The TPS, by updating individual databases, can provide such limited management information, as total amount of cash withdrawn and number of transactions for the day. TPSs can also produce reports for both internal and external users. In the bank example, the TPS can create monthly bank statements for customers and cash management reports for the bank's internal auditors. There are two ways to process transactions: batch processing, and realtime processing. In the early years, batch processing was the only way available and consisted of accumulating transaction data over a period of time and periodically processing it, for example, at the end of the business day or week. Today, realtime processing is the preferred method. Each time a transaction is conducted, the databases are immediately updated. It is easy to see why record keeping and accounting functions were early applications for electronic data processing systems.

In the 1960's, data processing evolved into what is called Management Information Systems (MIS). The idea behind MIS was to provide management with information they could use for decision making purposes. Whereas electronic data processing was the computerization of record keeping, MIS took it one step farther, attempting to link the stored data to the management decision-making process.

MIS brought together computer science and management science for the first time. Management and systems theory were

dissected to determine how, exactly, managers made decisions, what factors were involved in the decision-making process, and what inputs were required to make a decision. Then the computer scientists extracted from their computer databases management's desired inputs. Because of the relatively low state of the art in the 1960's, the result of this conceptually correct merging of sciences was management reports providing prespecified information at predetermined intervals.

Although this was a significant step forward, giving managers valuable information, it also created a new set of problems. In large organizations, the amount of data stored on computers was enormous, and as the databases grew, the number and size of the management reports also grew. Reports became overwhelming compilations of information, and managers soon became saturated with an overload of information. It became evident that simply giving managers all the data inputs possible, would not translate into improved decision-making. In fact, at times it may have actually hampered the decision making process.

A problem with the kinds of reports generated in the MIS era was that they tried to provide everything to everyone in the organization. A standard report might have been 1,000 pages long, encompassing a multitude of information. Manager A only needs a very small subset of the information provided, perhaps, and must glean through the entire report to pick out what he can actually use. This becomes time-consuming and often frustrating. Moreover, the

report may be generated only once a month; what if manager A requires updated information on a weekly basis, or manager B requires only quarterly data?

In the early years of data processing, providing computer resources was a very expensive proposition. All computing was done on large mainframe computers which only the largest organizations could afford. For example, in 1964, an IBM 360 computer cost several million dollars. In addition, these computers required a separate staff department to operate and maintain them. Naturally, organizations attempted to maximize the use of the computers. ADP departments would operate 24 hours per day, if not providing inhouse computer services, then providing ADP services to outside organizations in order to defray their fixed costs.

These large computers process data according to directions given in the form of computer programs. Computer programs are written by specially trained personnel called computer programmers. If a manager requests a specific report to be produced, a programmer must write a utility program directing the computer to do so. This also is an expensive undertaking, as computer programs are very detailed and require many hours to complete. Sometimes, programs are so involved that the time it takes to write one is measured in man-years rather than hours. In the 1960's, it was deemed more cost-effective to write fewer computer programs that were all-encompassing, than to write several user-specific programs. How wrong they were.

In the 1970's, the next generation of information systems was introduced, Decision Support Systems (DSS). What distinguishes DSS from MIS is that DSS allows for ad hoc data query. That is, it lets the manager interactively query very large databases to isolate information that is of particular interest to a specific problem on an as-needed basis. They have applied analytical and mathematical capabilities into the MIS framework to provide managers with more quantitative and integrated results. As was indicated previously, MIS resulted in massive reports that had to be sifted through for relevant information DSS culls out the desired data and presents it in a concise and readily useful form. "DSS couples the speed and thoroughness of automation with the insight of human experience and, where appropriate, a proper blend of quantitative support."

What makes DSS superior to prior information systems for management decision-making applications is that the end-user is able to initiate and control the computer directly, interacting with it to work out a solution to a problem. The manager can sit down at a computer terminal, query specialized databases in the computer, gather desired data, apply analytical models to the data, do what-if analysis, and apply the decision-maker's own experiences and judgments to the process in order to support management decisions. For the first time the decision-maker is a part of the information system, and not just a recipient of its output.

Some problems continued to plague users. Although the information systems were much better in providing useful

information to decision makers, they still had to navigate the treacherous computer operating system. Large computer systems were not "user-friendly" and continued to require users to jump through hoops to access and use the system. In addition, as the number of users on a computer increased, the speed and responsiveness of the computer decreased. Other problems also surfaced, such as data security and accessibility issues, data corruption, file sharing, and of course the ever-present worry of Big Brother (the boss being able to check up on you via usage monitoring).

The 1980's brought continued improvement to information systems, and at the same time took it in new directions. First, it became evident that most top level corporate executives did not use either the reports generated by MIS or the analytical and modeling capabilities of DSS. What the top executives needed was an easy way to get the critical information they wanted, when they wanted it, and in the format they wanted it. They needed a tailor-made information system. Therein lay the impetus for the development of Executive Information Systems (EIS). EIS provides easy access to selected information about key factors that are critical to accomplishing an organization's strategic objectives. These are called Critical Success Factors (CSF). Graphics are used extensively to create a picture which represents the status of the selected CSF variables. For example, current and projected trends shown graphically can give an executive a clear view of the data it represents and its effects

on the organization now and in the future, if the CSF variables affecting the trend are left unaltered. Executive Information Systems have the following capabilities and characteristics. They:

- are tailored to individual executive users
- extract, filter, compress, and track critical data
- provide online status access, trend analysis, exception reporting, and "drill-down" capabilities
- access and integrate a broad range of internal and external data
- are user-friendly and require minimal or no training to use
- are used directly by executives without intermediaries
- present graphical, tabular, and/or textual information

Second, Artificial Intelligence (AI) began to make inroads into the world of management information systems. Knowledge-based systems such as Expert Systems (ES) can serve as consultants to users by providing expert advice in selected, and to date, limited subject areas. The idea behind AI is to create computers that can think. To do this, very large databases are used and analytical (if-then) functions are programmed into the computer. It is a matter of storing all of the possibilities into the computer based on a tree

branching scheme. The computer can then walk through the possibilities, asking questions at given points to determine which branch to take, until it reaches the end of the tree structure and thus an answer.

Finally, information systems took a new direction with the development of end-user computing. End-user computing is a result of the phenomenal advances in microcomputer technology. Today, managers have more computing power in their desktop PC than large mainframe computers were capable of less than 30 years ago. In terms of hardware, they have faster processors, greater working memory, larger hard disk storage capacity, and greater communications capabilities. The high level of technology found in PC hardware has paved the way for similar advances in application software development. PCs give the manager the ability to utilize extremely sophisticated word processing programs, electronic spreadsheets, database management, and data communications. All of these are at his/her fingertips. Not only is the capabilities of the PC impressive, but so is its price. A fully loaded desktop PC costs less than one per cent of the cost of a large mainframe computer of 30 years ago, while providing much more power and capability. The low cost of PCs allows an organization to provide this valuable resource to most, if not all, levels of management.

## E. ELECTRONIC SPREADSHEET PACKAGES

The popularity of desktop PCs in recent years is a result of the excellent application software available for these computers. Taking advantage of speed, storage capacity, and other hardware advances, current software programs provide the user a wide range of capabilities that not only compare favorably with, but often exceed, those of large mainframe computers. In fact, where in the past PC software was derived from mainframe programs, now the reverse is true; PC application software development is now considered the cutting edge of computer programming. The most common type of application software packages found on PCs include: word processing, electronic spreadsheets, database management, telecommunications, graphics, and integrated software packages. Many of the leading software packages now incorporate application functions within their own. For example, a word processing package may include the ability to build limited spreadsheets and databases, and create graphics such as pie, line, and bar charts.

Electronic spreadsheets are widely used in business-oriented organizations. They are primarily "number crunching" software programs designed to be used for analysis, planning, and modeling. A spreadsheet is a worksheet made up of rows and columns. Data can be placed onto the worksheet and stored in the computer's memory. Formulas (mathematical directions) are also entered onto the worksheet, resulting in calculations performed on desired data groups. What makes the spreadsheet so useful is the ability to

perform multiple iterations of an operation in a very short time span. What-if modeling is especially conducive to electronic spreadsheets. The two leading electronic spreadsheet packages are Microsoft Excel and Lotus 1-2-3.

Microsoft Excel was designed for the Apple Macintosh operating system. However, as a result of its popularity, it is now also available for the Microsoft Windows operating system. Excel provides automated business tools for data analysis, list keeping, and calculations, as well as presentation tools for reporting results. Excel is based on worksheets. You can store, manipulate, calculate, and analyze data such as numbers, text, and formulas on the worksheet. Excel also provides database capabilities, where you can sort, search, and manage a large amount of information on the worksheet, using standard database operations. Excel also allows you to make charts to present your worksheet data visually.

#### **F. ELECTRONIC SPREADSHEETS AND THE COMPTROLLER**

At the TYCOM level, comptrollers have at their disposal large databases from which to gather information. Two of these large mainframe application programs are the Standard Accounting and Reporting System Field Level (STARS FL) and the Uniform Automated Data Processing System (UADPS). Both of these systems are operated at field level activities, which report to the TYCOM. Although most of the data for these programs are collected at the field level, the data is available to the comptroller's office. Within the comptroller's office, the Accounting office is responsible for

ensuring the field activities enter all required data and transactions and for submitting reports as directed. STARS FL and UADPS are traditional MIS systems. They are primarily transaction processing systems, generating reports containing prespecified information at predetermined times. They do, however, have a limited ability to provide data or reports on a query basis.

STARS FL and UADPS operate as large database accounting systems. The accounting system is designed to identify the purpose for which funds are spent by using an accounting classification code, ACC or "line of accounting." The ACC consists of nine data elements, which are used to provide a uniform system for accumulating and reporting accounting information. Each data element has one to 12 digits. The first data element is the Appropriation; it has seven digits: for example, 1751804. The first two digits indicate the agency symbol number (17 for Navy). The third digit reflects the fiscal year (FY) (5 for 1995). Digits four through seven show the actual appropriation number (1804 is Operation and Maintenance, Navy (O&M,N)). The ACC provides a vast amount of information in the space of 46 digits. The system allows the user to sort through thousands of funding actions and accumulate the value of the actions that used, say, FY1995 funding. The system also uses standard document numbers and job order codes, among others. Getting the specific information wanted is a matter of doing a sort or a status enquiry of the system.

Within the budget shop, analysts receive reports from STARS FL and UADPS when produced. These MIS programs are not capable of providing the kind of refined data required by the budget analysts. As can be seen by the variety of tasks and the responsibility placed upon the financial management personnel in the budget shop, it is quite evident that they need the ability to perform extensive analysis on the raw accounting data provided by STARS FL and UADPS. Electronic spreadsheets could be one answer to the problem. They could provide the analytical tools needed to carry out their daunting tasks. By using Excel or Lotus 1-2-3, analysts could dramatically increase the amount and level of budget analysis they perform. Spreadsheets would provide more and improved management information, which in turn would provide for better financial decision making. An investment in an electronic spreadsheet package for every financial management person in the budget shop would more than pay for itself in improved efficiency, effectiveness, and quality of the information derived.

With the decreasing Defense budget, the Navy needs better financial management information and analysis. As the need for analysis increases, financial management personnel need the tools to provide this higher level of service. An electronic spreadsheet is one of these tools, and a cheap one at that. It would put the Navy on a par with corporate America in terms of financial analysis, bringing it into the 90's and taking it into the next century.

## G. CONCLUSIONS

This chapter has described the comptroller organization and the responsibilities of the Budget Analyst. It pointed out the need Budget Analysts have to manage large volumes of financial data, in order to formulate budget estimates and execute budget plans. The chapter also provided a short history on the evolution of Financial Management Information Systems, highlighting the capabilities of electronic spreadsheets. Finally, it has suggested potential benefits to Budget Analysts using electronic spreadsheets in their work.

In the next chapter, Budget Offices at selected Navy activities will be examined to determine the extent to which electronic spreadsheets are in use. Who is using them? How are they being used? And; how complex are the spreadsheets, in terms of formulas and functions?

### **III. SOFTWARE**

#### **A. INTRODUCTION**

This chapter will describe the extent to which PC-based software, in particular electronic spreadsheet software, is used by comptrollers in the Navy. Based upon interviews with numerous comptroller shops, I will show how spreadsheets are used and who is using them.

#### **B. THE ACCOUNTING OFFICE AND STARS/STARS FL**

Comptroller departments are divided into two primary functional areas: Accounting, and Budgeting. Accounting is focused on the exacting task of tracking, recording and reporting financial transactions. Accounting requires absolute precision and detail. Because of the exactness required, accounting personnel use computers to collect and record financial transactions. The vast amount of data required to be recorded and maintained in Navy accounting offices led to the development of specialized software.

The Standard Accounting And Reporting System (STARS) is the official accounting system for the following Systems Commands (SYSCOMS):

- Naval Supply Systems Command (NAVSUP)
- Naval Sea Systems Command (NAVSEA)
- Naval Air Systems Command (NAVAIR)
- Space and Naval Warfare Systems Command (SPAWAR)
- Naval Facilities Engineering Command (NAVFAC)

- Strategic Systems Program Office (SSPO)
- Office of the Chief of Naval Research (OCNR)

All funds that are allocated or suballocated through the Systems Command are accounted for in STARS. The use of STARS provides accurate, detailed and timely information to financial managers at various levels with the visibility necessary to execute their programs. It allows headquarters and field activity users to have immediate access and up-to-date information on their programs via the STARS terminal. STARS was designed to include the complete budget execution phase and allows fund administrators, other SYSCOMS, program managers and other budget review levels access to actual progress against their approved POM/budget line items.

STARS provides consolidated accounting and reporting from receipt of the allocation by the major claimant through the initiation, commitment, obligation and disbursement levels for funds managed by the users.

STARS is more than a traditional transaction processing system. It is a large, complex data base which provides for real-time retrieval of current information. The extraction of specific data is accomplished through a query process. Inquiries available through STARS include Document Status, Status of Funds, and Transaction History Inquiries. In addition, standard monthly summary reports are generated, as are special request reports.

STARS has been in use for several years by the SYSCOMS. Until recently, this type of accounting system has not been available to other Navy organizations: now it is. STARS FL (Field Level) is being implemented into shore stations and activities within the United States. Once fully implemented, STARS FL should provide the same accurate and detailed level of data as STARS. One of the most significant benefits of using STARS FL is the real-time visibility of financial data it will provide to higher levels in the funding chain. That is, once a funding obligation is recorded at a shore station it is in the data base and can be viewed by comptrollers at the TYCOM or CinC level. Also, the obligation is reflected in budget balances throughout the Navy comptrollerships.

STARS FL is a major improvement in the formal system of recording and tracking appropriated funding in the Navy. However, STARS FL is not a perfect system. STARS FL is intended to be used by diverse organizations whose accounting requirements do not all fit the same mold. For example, in the aviation community, a large portion of the budget is based upon Flight Hours. Aviation commands have a need to track funding usage at a level of detail not available within STARS FL. In order to accumulate the appropriate funding data at the level of detail required, COMNAVAIRPAC had a software program developed to manipulate the STARS FL data. Their specialized software package is called ACES.

STARS FL was implemented at Lemoore and Miramar Naval Air Stations in July of 1994. In interviews with accounting personnel

from each activity, the consensus was, given adequate time and training, STARS FL could be a very good system. However, at present, it was felt that the implementation schedule was ill-conceived: too near the start of the fiscal year, and the level of training was not acceptable. The instructors were not very knowledgeable about STARS FL and there was a lack of study guides/user manuals.

Within Navy Accounting offices STARS/STARS FL is the primary computer software used. As required by individual activities, additional software packages such as ACES are used to augment STARS FL. Because of the nature of the work and reliance on formal systems such as STARS/STARS FL in Accounting offices, it was noted that PC-based software such as electronic spreadsheets and presentation packages were not in use.

#### C. THE BUDGET OFFICE AND ELECTRONIC SPREADSHEETS

The Budget shop is the second functional area within the Comptroller office. Budget Analysts have a more dynamic role in financial management than Accounting personnel. Where Accounting personnel, in general, are concerned with establishing historical record, i.e., what *has* happened, Budget analysts are more concerned with planning the future, i.e., what *will* happen. The difference in perspective between Accounting and Budget personnel also causes a difference in economic viewpoint. Accounting deals with funding at a very micro level, ensuring that every cent is accurately accounted for and recorded. Budget analysts are not concerned with the

minutiae; their viewpoint is on a more macro level for analysis and decision making.

Since the focus of a Budget Analyst is not the same as the Accounting personnel who use STARS/STARS FL as their main tool, what tools do Budget Analysts use in performing their job? Numerous telephone interviews were conducted with Navy Budget Analysts to ascertain what software tools they used to accomplish their work. In discussing the results of the interviews, I will begin at the lowest level of the comptroller budget analyst food chain: the field level shore station, and then work up the chain to the Office of the Navy Comptroller.

#### **1. Lemoore Naval Air Station**

The Budget Office at Lemoore Naval Air Station consists of four budget analysts, including the Budget Officer. The Budget Officer indicated that the spreadsheet software used in their office was Lotus 1-2-3 for Windows. She said that all four analysts use 1-2-3 on a daily basis and it is the primary software package used in the office. Word processing and database software was also available in the office, but not used nearly as much as the spreadsheet software. Although each analyst is responsible for different sections of the budget, they all use 1-2-3 in two separate ways: for external reporting, and for internal analysis.

##### **a. External Reporting**

During the budget formulation process, the Budget Officer receives budget exhibit templates as part of the budget call from the

TYCOM. Templates are preformatted spreadsheet worksheets, with predefined layout and formulas so that the budget analysts need only fill in the blanks to complete them. They are in 1-2-3 spreadsheet format, and are designed to create the OP-5 and OP-32 budget exhibits. These exhibits contain supporting and backup data for the budget estimates. The Budget Office receives the templates from the TYCOM via modem, pulling them down from the TYCOM Comptroller computer bulletin board. When the exhibits are completed, they are submitted back to the TYCOM through the bulletin board system.

**b. Budget Analysis and Monitoring**

Analysts find it useful to lay out the budget in a spreadsheet worksheet. They can show how much has been budgeted to each workcenter or department, and what the expected or planned expenditure or obligation rate is over the year. Once this is set up at the beginning of the fiscal year, they can then monitor the budget by comparing the planned rate to the actual rates. Using a utility program written in dBASE, they are able to strip selected data (actual expenditures and obligations) off of the STARS FL accounting system and import it to the spreadsheet. Having the planned versus actual data side by side makes analysis very easy. Given the actual spend rate, a projection can be made as to when the budgeted funding will run out, or if there will be an excess or shortfall in funding. Sensitivity analysis can be performed, as well as what-if drills on any number of scenarios. This type of analysis can

provide the basis for midyear review take-backs or increases to individual workcenters at the local level. It also provides support at the TYCOM midyear review to defend the budget from reductions or requests for augments.

The Budget Officer indicated that she also used the spreadsheet software to create graphs on an ad hoc basis. Graphs can be created using data from a worksheet to visually depict trends in obligations, expenditures or any attribute selected. It has been said that a picture is worth a thousand words. The graphs are used in briefings, presentations and status reports. None of the spreadsheets examined contained graphs by design. However, a variety of graphs can be drawn very quickly through the spreadsheet software, eliminating the need to specifically code a graph into each spreadsheet.

Given the importance of spreadsheets in the Budget Analyst's work, what is the spreadsheet knowledge level of the Budget Analysts at NAS Lemoore? According to the Budget Officer, knowing how to use spreadsheets is an important skill for analysts to have. In her shop, the knowledge level runs from "pretty good" to "just learning." Most of the analysts are not proficient in spreadsheet usage when hired. Entry level analysts tend to come from the ranks of accounting technicians in the Accounting office. As accounting technicians, they do not have any background or experience with spreadsheets. Formal spreadsheet training is not available to employees; so, on-the-job training (OJT) and learn-as-you-go are the

primary methods of learning. The analysts learn as a team; if someone learns or discovers a new "trick" it is quickly passed along to all the others in the shop. Within the budget shop, there are no standard spreadsheet models. Analysts create their own spreadsheets according to their own personal needs and requirements to do their own job.

Spreadsheets are tools that are used to varying degrees. Some are large and complex and used indefinitely; others are small ad hoc spreadsheets that are used once, and then deleted.

#### c. Spreadsheet Analysis

Twenty-three spreadsheets from NAS Lemoore were examined. Table 1 describes the size of the spreadsheets in terms of computer disk space used (bytes) and by the number of cell formulas found within each spreadsheet. The table also indicates, subjectively, if the spreadsheet formulas are relatively simple or complex. Simple formulas are those that add, subtract, multiply, divide or use simple functions such as @SUM, @ROUND, @IF, or @AVG. Complex spreadsheets would use "higher level" functions, such as @IRR (internal rate of return), @NPV (net present value), or @DDB (calculating double declining-balance depreciation). Finally, the table provides a list of the most-often used formulas/functions in each spreadsheet.

The spreadsheets range in size from 4,265 bytes to 140,403 bytes, and from 25 formulas to 2,992 formulas. However, the most notable finding, after examining the 23 spreadsheets, is that

Spreadsheet Number	Size in Bytes	Number of Formulas	Complexity		Comments
			Simple	High Level	
1	97,587	968	X		@SUM, +,-
2	16,409	262	X		@SUM, +,-
3	7,539	43	X		@SUM, +,-
4	10,182	65	X		@SUM, +,-
5	11,024	52	X		@SUM, +,-
6	6,457	64	X		@SUM, +
7	9,861	81	X		@SUM, +,-
8	8,315	80	X		@IF, @SUM, >, +,-
9	54,484	676	X		@IF, @SUM, +
10	115,066	2,044	X		@IF, @ROUND, @SUM, *, /, +,-
11	4,265	25	X		@IF, @SUM, >, +,-
12	33,985	197	X		@IF, @SUM, +,-
13	55,911	656	X		@IF, @ROUND, @SUM, >, *, /, +,-
14	8,402	57	X		@IF, @ROUND, @SUM, >, *, /, +,-
15	8,521	40	X		@SUM, *, /, +,-
16	60,166	802	X		@IF, @ROUND, @SUM, *, /, +,-
17	24,684	281	X		@IF, @ROUND, @SUM, +
18	10,174	78	X		@SUM, +,-
19	24,325	250	X		@SUM, +,-
20	25,087	55	X		@SUM, +
21	21,831	234	X		@SUM, +,-
22	137,163	2,992	X		@AVG, @IF, @ROUND, @SUM, +,-
23	140,403	1,805	X		@IF, @ROUND, @FALSE, >, <, *, /, +,-

they are all relatively simple. There are no higher level formulas or functions in any of the spreadsheets. The most common function used among the spreadsheets was @SUM, or, adding numbers in a row, column or series of cells. It seems that the spreadsheets are being used largely as a labor-saving device, cutting down on the man-hours that would otherwise be necessary if all of the required calculations, simple as they may be, had to be done on an adding machine or calculator. The spreadsheets also allow for the recording and saving of large quantities of numbers for the record and for future use: again, a labor-saving device.

The spreadsheets were being used mostly to track and monitor budget execution, and to accumulate and assign costs to various work centers and departments. Many were in a report format, or were designed to create reports, to be given to subordinate organizations or to higher level commands such as the TYCOM.

## 2. Miramar Naval Air Station

At NAS Miramar, the Budget shop consists of three budget analysts. They also use Lotus 1-2-3 for Windows. Their use of, and experience with, spreadsheets mirrors that of NAS Lemoore with only a few exceptions. The Budget Analysts use STARS FL to a greater extent at Miramar than at Lemoore. The senior Budget Analyst indicated that STARS FL is used by their analysts continually. However, Miramar does not have the capability to download desired data from STARS FL as does Lemoore. They must manually input data from the STARS FL system to their own

spreadsheets. This could explain the increased usage. Another difference at Miramar is that basic computer training is available to workers, but it does not focus on spreadsheet applications. Analysts are expected to know how to use spreadsheets, and for the most part they learn through OJT.

### **3. Force Comptroller**

The next step up the comptroller ladder from NAS Lemoore and NAS Miramar is the Force Comptroller at COMNAVAIRPAC, the TYCOM. The Budget Office at AIRPAC consists of five budget analysts, including the Budget Officer. Spreadsheets are an essential tool here, just as they are at the Air Stations. Budgets at AIRPAC include all of the Naval Air Stations on the West Coast, as well as all Pacific Fleet aviation commands and activities. AIRPAC receives budget exhibit templates from CinCPACFLT as a part of the budget formulation process. AIRPAC in turn passes these templates on to the field activities. Once the field activities submit their completed budget exhibits, AIRPAC rolls them all up into their own budget exhibits, which are then forwarded to CinCPACFLT. Likewise, in the budget execution phase, AIRPAC budget analysts monitor actual versus planned spending rates of the various activities to identify trends and spot potential problems. The main difference between the Force Budget Office and the field activities is the size of their budgets. The Force Budget Analysts can pull data from the STARS FL system directly for field activities; however, for fleet aviation commands, financial data is collected via the monthly Budget OPTAR

Report (BOR). Spreadsheet proficiency at this level is greater than at the field activity level. Budget analysts tend to have more years of experience, and there is a greater expectation that they know how to use spreadsheets. Lotus 1-2-3 is also the standard spreadsheet software at AIRPAC. One analyst indicated that spreadsheet software is so versatile he uses it not only for spreadsheets, but also for data base applications, graphics and word processing.

Outside the realm of aviation, there is the COMNAVSURFPAC Comptroller organization. Their Budget Office has 11 budget analysts, all of whom use QuattroPro spreadsheet software. QuattroPro is used because of its flexibility with other software at the Command. There is no problem with compatibility between other spreadsheet software, according to the senior Budget Analyst, since data from one spreadsheet program can be easily converted to other spreadsheet programs as required. Here, Budget Analysts are expected to be proficient in the use of spreadsheets. Spreadsheet proficiency is discussed during the hiring process. The complexity and sophistication of spreadsheets is dependent upon the creator's own skill and relative comfort in using computers and software applications. Again, spreadsheets run the spectrum of very simple to very complex.

#### 4. Commander in Chief U. S. Pacific Fleet

Both AIRPAC and SURFPAC report to CinCPACFLT. The CinCPACFLT Comptroller receives its budget call guidance and exhibit templates from NAVCOMPT, who in turn, pass the templates down to

the Force Comptrollers. Upon completion and return of the Force Comptroller's budget exhibits, it then also rolls them up into its own for submission. Lotus 1-2-3 is the standard spreadsheet software, and is the primary financial management tool used in the CinCPACFLT Comptroller office. Budget Analysts believe spreadsheets are the primary medium for budgeting data and Lotus 1-2-3 is the only software tool they need.

#### **5. Navy Comptroller's Office**

NAVCOMPT is the organization responsible for the financial management of the Navy. Within NAVCOMPT is the Office of Budget and Reports. The Program/Budget Coordination Branch Head (NCBG-2) indicated that the spreadsheet software used within NAVCOMPT is Lotus 1-2-3 for Windows. The organization is very computer-oriented. Prior to their current PC/LAN-based system, NAVCOMPT utilized mainframe VAX computers and relied upon in-house computer programmers for their application and utility software needs. NCBG-2 has 65-70 personnel, of which 80% are regular users of electronic spreadsheets. Civilians make up 80% of the workforce, and the military comprise the remaining 20%. It is estimated that 90% of the workforce is proficient in the use of spreadsheets, and 20% of these could be classified as "power users" (extremely knowledgeable and experienced with spreadsheets). By the time people make it to NAVCOMPT, they tend to have a lot of experience in the budgeting arena and consequently also in using spreadsheets.

At NAVCOMPT analysts use spreadsheets for budget estimating and in performance criteria analysis. Analysts create spreadsheets on an ad hoc basis. And, as in other budget offices, they vary in complexity and use as a function of the analyst's needs and abilities.

NCBG-2 maintains two computer programmers from the mainframe computer era, and are utilizing their skill and experience to create electronic spreadsheet templates. Within the next year, NAVCOMPT plans to have a small library of templates that can be used by budget analysts and financial managers for a variety of tasks.

#### D. CONCLUSIONS

The main message of this chapter is that spreadsheets are being used extensively in the budget shops at every level of the comptroller organizations examined. Budget Analysts believe spreadsheets are their most important tool in budgeting. Spreadsheets at the Air Station level are relatively simple in design, and are not being used for sophisticated analysis, but rather, are used to manipulate and accumulate large quantities of numbers. Their use seem to be an important labor-saving device.

In the next chapter, we will discuss the use of spreadsheets in the Financial Management Curriculum at the Naval Postgraduate School. Should students be proficient in using spreadsheets? Is spreadsheet proficiency an issue at other Business Schools?

## IV. SPREADSHEET TRAINING

### A. NEED FOR ELECTRONIC SPREADSHEET TRAINING

Should graduates of the Financial Management Curriculum (837 program) at the Naval Postgraduate School be proficient in the use of electronic spreadsheets? In this chapter, I will discuss what level of exposure to electronic spreadsheets students are afforded in the Financial Management Curriculum: if this level of exposure is adequate: and how the level of exposure to electronic spreadsheets at NPS compares to other graduate Business Schools.

#### 1. Spreadsheet Proficiency

The Naval Postgraduate School Catalog states:

The objective of the Financial Management Curriculum is to prepare officers for business and financial positions within the Navy. Financial Managers assist the Navy's decision-making processes at all levels by preparing accurate, timely and relevant information. They are concerned with the optimal allocation of human, physical and financial resources to achieve the Navy's goals and objectives while assuring efficient and effective expenditures of public funds....Graduates of the Financial Management Curriculum will be prepared for assignment to positions in budgeting, accounting, business and financial management, and Internal Control and Auditing.' [Ref. 3: p. 42]

Every organization in the Navy is, at some level, a part of the budgeting process; from the smallest workcenter, responsible for development of their future OPTAR budget requirements and the obligation of their current OPTAR funding; to NAVCOMPT, responsible for the entire Navy budget process, from planning through execution. No matter where a graduate of the 837 program is assigned, there will be a need to know how to plan, develop, monitor or analyze a budget. The better able a manager is to understand how the budget process works and how to most effectively manage that process, the more effective that manager will be in fulfilling his/her command's mission.

The most important tool used in the budgeting arena is the electronic spreadsheet. As discussed in Chapt. III, spreadsheets are used at every level of budgeting, from the field level shore stations to NAVCOMPT, as well as across warfare communities.

Completion of the Financial Management Curriculum qualifies the officer graduate as a Financial Management Subspecialist, and is assigned the subspecialty code XX31P. Typical jobs that graduates with the subspecialty code XX31P can expect to be assigned to include:

- Comptroller: Naval Air Stations
- Budgeting Commander: Naval Medical Command, Washington, DC

- Accounting Commander: Naval Medical Command, Washington, DC
- Budget Officer Commander: Naval Air Forces Atlantic, Norfolk, VA
- Comptroller: Naval Fleet and Industrial Supply Centers
- Fiscal Officer: Naval Fleet and Industrial Supply Centers
- Public Works Officer: Weapons Stations, CONUS
- Cost Analysis Office of Secretary of the Navy: Washington, DC
- Special Assistants Program: Planning Office (Navy), Fiscal Management Division

Given the importance of spreadsheets to the budgeting process, the role budgeting plays in financial management, and the expectation that graduates of the 837 program will be assigned to financial management jobs, extensive spreadsheet exposure and usage would seem to be necessary ingredients to the learning experience, in order to produce Financial Managers proficient in spreadsheets. Spreadsheet proficiency should be a specific and integral part of the Educational Skill Requirements of the curriculum.

## **2. The Use of Spreadsheets in the Classroom at NPS**

The Financial Management Curriculum at the Naval Postgraduate School is a six-quarter course of study requiring the completion or validation of 32 quarter hours of the Management

Fundamentals program, completion of 48 quarter hours of graduate level courses and submission of an acceptable thesis. Two courses, 8 quarter hours, are selected by the student from seven curriculum option courses. As reflected in Table 2, there are only two required courses in the curriculum that are designed to use spreadsheets, IS0123, Computer Skills Development; and MN4163, Analytical Techniques for Financial Control and Planning. There is also one course that is not specifically designed to use spreadsheets; however, there are some instructors who teach this course who choose to integrate spreadsheets into the course work. Table 3 indicates which of the curriculum option courses use spreadsheets in their course work. Among the optional courses, one course, MN4145, Policy Analysis, may use spreadsheets at the instructor's discretion.

IS0123 is an eight-week zero credit course taken by all Systems Management Department students during their first quarter at NPS. The course is designed to be an introduction to the use and operation of microcomputers and teaches the use of two software application programs, WordPerfect and Lotus 1-2-3. The course is divided between the two applications, and each one is taught for less than four weeks. The instructor for the course indicated that her goal was not to make students proficient in the use of spreadsheets, but to teach the students the basics of how to use them: enough to get them through the NPS curriculum, and perhaps spark an interest

Course Number	Credit Hours	Course name	Note
MN2150	4	Financial Accounting	N
MN2031	4	Economic Decision Making	N
MN3333	4	Managerial Communication Skills	N
MA2300	5	Mathematics for Management	N
IS0123	0	Computer Skills Development	Y
MN3161	4	Management Accounting	N
MN3140	4	Microeconomic Theory	N
MN3105	4	Organization and Management	N
OS3101	5	Statistical Analysis for Management	N
MN4161	4	Management Control Systems	N
MN3172	4	Public Policy and Budgeting	O
MN4162	4	Cost Accounting	N
OS3006	4	Operations Research for Management	N
MN3154	4	Financial Management in the Armed Forces	N
MN4163	4	Analytical Techniques for Financial Control and Planning	Y
MN4151	2	Internal Control and Auditing	N
IS3183	4	Management Information Systems	N
NS3252	4	Joint and Maritime Strategic Planning	N
MN3301	4	Systems Acquisition and Project Management	N
MN4105	4	Management Policy	N
MN3805	2	Total Quality Leadership	N

Table 2. Use of Spreadsheets in Required Courses.

Note:

Y indicates spreadsheets designed into course work.

N indicates spreadsheets not designed into course work.

O indicates spreadsheets used at instructor's discretion.

Course Number	Credit Hours	Course Name	Note
MN4122	4	Planning and Control	N
MN4152	4	Corporate Financial Management	N
MN4159	4	Financial Reporting and Analysis	N
MN4145	4	Policy Analysis	O
MN4302	4	Defense Resource Policy and Management	N
MN4305	4	Defense Technology Policy	N
OA4702	4	Cost Estimation	N

Table 3. Use of Spreadsheets in Optional Courses.

Note:

Y indicates spreadsheets designed into course work.

N indicates spreadsheets not designed into course work.

O indicates spreadsheets used at instructors discretion.

(Students select two courses from above as their course electives.)

in individuals to learn the advanced capabilities of spreadsheets on their own. Although there seems to be an increasing need to teach the use of spreadsheets, the four weeks allotted to it in IS0123 is actually going to be reduced to two weeks. Later this year, IS0123 will move the spreadsheet portion of the course to the student's third quarter, cutting the class time in half. The two weeks cut from the spreadsheet course will be replaced by two weeks of learning to use presentation software.

An increasing number of students are taking the option to validate IS0123. Students can test out of the word processing and/or the spreadsheet sections of the course. Table 4 shows the increasing

Quarter	Number Enrolled	Number Validating	Percentage Validating
Summer '90	182	9	4.95
Winter '91	88	5	5.68
Summer '91	168	32	19.05
Winter '92	102	15	14.71
Summer '92	166	32	19.28
Winter '93	108	20	18.52
Summer '93	182	22	12.09
Winter '94	102	25	24.51
Summer '94	150	42	28.00
Winter '95	72	23	31.94

Table 4. Percentage of Students Validating the Lotus 1-2-3 Portion of IS0123. [Ref. 4]

percentage of students who validate Lotus 1-2-3. The Table indicates that almost one third of the students validate the spreadsheet portion of the course, up from less than five percent four years ago.

Analytical Techniques for Financial Control and Planning, MN4163, is the only course designed to teach the use of spreadsheets. This course teaches students to build decision models and stresses their importance in facilitating decision analysis. This had been an elective course, and was recently changed to one that is

required. The professor who teaches this course felt that the students did not have an adequate background in spreadsheets prior to taking his course. He indicated that he had to spend valuable classroom time teaching basic spreadsheet usage.

Public Policy and Budgeting, MN3172, is not specifically designed to use spreadsheets in its course work. However, spreadsheets are used depending on which professor is teaching the course during any given quarter. The professors who do use spreadsheets utilize a budgeting simulation game that lets students do what-if drills to develop a national budget and taxation plan. Tracking budget bills through the Congress is also accomplished via spreadsheets.

Of the optional courses, Policy Analysis, MN4145, is another course where a student may or may not use spreadsheets. Again, it depends on who is teaching the course. One professor uses spreadsheets quite extensively in his classes, whereas other instructors do not. The professor who uses spreadsheets in his class teaches his students methods for optimizing the use of scarce resources using spreadsheet modeling. This course had been required but was recently changed to an elective course. This means that not all Financial Management students will receive this spreadsheet exposure.

### 3. Adequacy of Spreadsheet Training at NPS -- The Student's Perspective

Financial Management students of the June 1995 graduating class were interviewed to gain their perspective as to the adequacy of their spreadsheet training while at NPS. Although not all 20 students were interviewed, the 13 students that were are representative of the entire group. Of the students interviewed, three validated the Lotus 1-2-3 portion of IS0123. Two others felt they could have validated it if they had tried. Half of the group had never used a spreadsheet package prior to NPS, and two had never used a computer prior to NPS. On the other hand, one person described himself as a "power user" and "computer geek."

After nearly 18 months of course work and now approaching graduation, the students were asked if the level of spreadsheet training seemed adequate considering the nature of their curriculum and their future job assignments. Surprisingly, more than half indicated they were content with their level of exposure to spreadsheets. Many said that they know a lot more about spreadsheets now than they did 18 months ago, and that it is all they will need to know. Several students are not going to be going to financial management jobs when they leave NPS; instead, they will be going to department head school, and then back to sea duty. They felt the level of spreadsheet proficiency gained at NPS would help them as department heads, and more personally, with their family's

finances. Going to a financial management payback tour was seen as "down the road a ways," and any additional spreadsheet training needed could be learned on the fly when they got there. Some of the students did say that once they learned the basics of spreadsheets they were able to continue learning on their own or through fellow students working in group projects. Students who took any of the courses whose professors used spreadsheets in their course work felt they learned valuable applications in their use.

#### 4. Adequacy of Spreadsheet Training at NPS -- the Faculty Perspective

The issue of incorporating the use of spreadsheets into curriculum course work comes down to how comfortable individual professors are themselves in using spreadsheets and computers. If a professor does not have much experience in this area, he/she will be hesitant to try it. Faculty members have seen an increase in the use of computers and various software applications in the classroom over the last couple of years, and expect that trend to continue. As to the adequacy of spreadsheet training in the Financial Management Curriculum, the faculty members interviewed collectively had a "gut feeling" it was not adequate, but they could not quantify the level of training required. The Academic Associate for Financial Management has recently distributed a memorandum asking for input from the faculty on this very issue.

In a 1992 report, the NPS Financial Management curriculum was compared to the curriculums of 54 Financial Management

Programs in U.S. Higher Education Institutions. The authors' conclusions indicate that the NPS Financial Management curriculum compares favorably overall to the curriculums compared. Three recommendations were made by the authors for improvement of the NPS Financial Management program. The first recommendation was "more hands-on computer instruction could be integrated into the accounting, economics, management control systems, statistics and operations research courses offered at NPS." [Ref. 5: p. 36]

The Academic Associate for both Acquisition and Contract Management, Curriculum 815, and Systems Acquisition Management, Curriculum 816, indicated that students in both 815 and 816 use spreadsheets in their course work. There is no explicit requirement to know how to use them; however, there is an implicit expectation that students not only understand their use, but that they use them in completing course work. Assignments do not specifically state work must be done using a spreadsheet, but if the task lends itself to using one, then he expects a student to use it without prior discussion. Students are expected to use spreadsheets in the completion of case study assignments, which are used extensively in MN3304, Contract Pricing and Negotiations.

#### **5. The Use of Spreadsheets at Other Graduate Business Schools**

Telephone calls were made to a number of highly regarded Business Schools to solicit information concerning the use of spreadsheets in their MBA programs. The overall consensus among

the Business Schools was that the use of spreadsheets in the MBA curriculums was increasing. No firm statistics had been collected by the schools in this area, but their feelings were that the use of spreadsheets throughout the MBA curriculum was extensive. It was also felt that since these were graduate students, they should already be familiar with spreadsheets through undergraduate studies or through work experience. Most of the schools did not have electronic spreadsheet prerequisites for admission to their programs. However, most schools did have spreadsheet workshops available to those students who did not have experience with them or who needed a refresher.

At the University of Pennsylvania, the Wharton School of Business offers a workshop on computer skills for students the summer before the start of the MBA program. This workshop is not required; however, Excel spreadsheets are used in a number of courses, and no class time is taken to teach students how to use it. It is the student's responsibility to know how to use spreadsheets to get through the program.

Stanford University has a requirement that students know how to use spreadsheets. Students who do not have this knowledge must enroll in a spreadsheet workshop. Approximately 50 out of 360 students have taken the workshop. Stanford uses spreadsheets extensively throughout the curriculum.

The University of Wisconsin-Madison School of Business expects students to know and use spreadsheets as well as other

software. The Associate Dean for Master's Programs indicated that prospective students are screened during the application process to ensure they have adequate computer skills, which include spreadsheets. He also believes that very soon, students will be required to have a personal computer and software as a condition for admission to the MBA program. Spreadsheets are used throughout the curriculum.

The University of California-Berkeley, also uses spreadsheets extensively in their graduate program. They require students to take a computer skills test and they must meet threshold standards in the use of spreadsheets, among other skills.

The use of spreadsheets seems common- place at the best business schools. Students are expected to know how to use spreadsheets upon entering the programs and be proficient in their use after completing the curriculums. The reason MBA programs require proficiency in spreadsheets stems from the fact that the business world wants the people they hire to be proficient in their use. Spreadsheets are a basic business tool that every MBA is expected to know and use.

## **B. CONCLUSIONS**

It is apparent from this chapter that students in the Financial Management Curriculum at NPS do not receive adequate exposure to, nor proficiency in the use of, electronic spreadsheets. Although many students feel they receive sufficient spreadsheet training, the

type of financial management jobs they will most likely fill suggests that they will, indeed, need to be proficient in their use.

Financial Management students at the Naval Postgraduate School do not receive as much exposure to electronic spreadsheets as their counterparts at some of the best business schools in the nation.

Recent increases in the amount of spreadsheet exposure students receive is a positive sign, and hopefully, a continuing trend.

## V. CONCLUSIONS

### A. INTRODUCTION

The conclusions offered in this chapter are based upon readings, interviews, and observations made during the research conducted in the course of this thesis.

### B. CONCLUSIONS

The Department of Defense resource allocation system revolves around the process of formulating, submitting, justifying, executing, monitoring, analyzing, defending, protecting, and reporting on the budget. Budget Analysts are among the corps of professional Navy Financial Management personnel who are responsible for ensuring the budget process is run efficiently and effectively. Budget Analysts must process vast amounts of financial data to formulate budget estimates and execute budget plans.

Budget Analysts have found that the use of electronic spreadsheets is the best method to monitor and track financial data and to generate financial reports. Every budget office examined in the course of conducting research for this thesis used spreadsheets extensively in the conduct of their business. From Naval Air Stations to NAVCOMPT, and at every level in between, spreadsheets were the Budget Analyst's primary tool. They allow Budget Analysts to lay out, in a systematic format, the financial data they are concerned with, and to manipulate that data in order to better track and

monitor it. Analysis of actual spreadsheets in use at a Naval Air Station found that they were all relatively simple in design, and were being used to accumulate large quantities of numbers. These numbers were then totalled or otherwise manipulated to produce the desired management information. Typical management information produced was total funding obligations by activity, department, subactivity group, or cost center. Spreadsheets allowed the Budget Analysts to keep a running total over time, having only to add the incremental changes each period. Budget Analysts were not utilizing the analytical capabilities built into newer versions of spreadsheet software. Of the 23 spreadsheets analyzed, there were no higher order formulas or functions used. This would suggest that spreadsheets are being used as a labor saving device, and not as an analytical tool.

Lotus 1-2-3 was the spreadsheet software found most often at the activities examined. However, some activities were using Excel or QuattroPro software. There is no requirement for standardized spreadsheet software nor does there seem to be a need for standardization. Most spreadsheet software have the ability to convert other spreadsheets into their own.

The Financial Management Curriculum at the Naval Postgraduate School appears to be deficient in providing an adequate level of spreadsheet exposure to its students. Graduates of the Financial Management Curriculum will most likely fill financial management positions at some time in the future. The extensive use

of spreadsheets at all of the budget activities examined foretell the need to be proficient in their use. Comparable institutions of higher learning integrate the use of spreadsheets throughout their MBA curriculums and expect their students to be fluent in their ability to use them. NPS currently requires Financial Management students to take a short course to learn the basics of Lotus 1-2-3, and to take one course that uses spreadsheets by design. As NPS professors become comfortable with their use, they will begin to integrate their use into the courses they teach.

### **C. RECOMMENDATIONS**

Inasmuch as Financial Management students will most certainly be expected to fill financial management positions of responsibility, and that spreadsheets are a basic tool in the budgeting process, it is recommended that a spreadsheet proficiency requirement be added to the Educational Skill Requirements for the Financial Management Curriculum (837). In addition, since hands-on experience is a valuable learning method, it is recommended that the use of spreadsheets be integrated into several of the Financial Management Curriculum courses. Finally, an elective/optional workshop or course in advanced spreadsheet techniques and applications should be offered.



**APPENDIX A**  
**SAMPLE SPREADSHEETS**

These spreadsheets are examples of the types of spreadsheets used by the Budget Office at the field activity, Naval Air Station, level.



A	B	C	D	E	F	G	H	I	J	K	L	P	Q
47													
48	1A (ET)	0	967	967	86	881	(20)	106				86	967
49	1A ADMIN	0	0	0	(6)	8						0	8
50	1A FUEL	0	0	0	(113)	113						0	113
51	1A AVDLR	0	0	0	(16,857)	16,857						0	16,857
52	1A O/I	0	0	0	(11,241)	11,241						0	11,241
53													
54	1A TOTAL	0	967	967	(28,133)	29,100	(20)	106	0	0	0	86	29,186
55													
56	2A (MG)	0	253	253	(5)	258	(5)					(5)	253
57	2A ADMIN	0	0	0	0	0		50				50	50
58	2A FUEL	0	0	0	0	0						0	0
59	2A AVDLR	0	0	0	(24,015)	24,015						0	24,015
60	2A O/I	0	0	0	(16,007)	16,007						0	16,007
61													
62	2A TOTAL	0	253	253	(40,027)	40,280	(5)	50	0	0	0	45	40,325
63													
64	3A (CF)	1,005	27	1,032	0	1,032	(21)				27	6	1,038
65													
66	GRAND TOTAL	47,205	(3,611)	43,594	(73,700)	117,294	(983)	(5,384)	(307)	246	0	(6,428)	110,866
67													
68													

Formulas  
 Current file  
 D10: +E10-C10  
 F10: +E10-G10  
 P10: @SUM(H10..O10)  
 Q10: +G10+P10  
 D12: +E12-C12  
 F12: +E12-G12  
 P12: @SUM(H12..O12)  
 Q12: +G12+P12  
 D13: +E13-C13  
 F13: +E13-G13  
 P13: @SUM(H13..O13)  
 Q13: +G13+P13  
 D15: +E15-C15  
 F15: +E15-G15  
 P15: @SUM(H15..O15)  
 Q15: +G15+P15  
 D17: +E17-C17  
 F17: +E17-G17  
 P17: @SUM(H17..O17)  
 Q17: +G17+P17  
 D18: +E18-C18  
 D20: @SUM(D16..D19)  
 G18: 1658-570  
 F18: +E18-G18  
 F20: @SUM(F16..F19)  
 P18: @SUM(H18..O18)  
 Q18: +G18+P18  
 Q20: @SUM(Q16..Q19)  
 C20: @SUM(C16..C19)  
 E20: @SUM(E16..E19)  
 G20: @SUM(G16..G19)  
 H20: @SUM(H16..H19)  
 I20: @SUM(I16..I19)  
 J20: @SUM(J16..J19)  
 K20: @SUM(K16..K19)  
 L20: @SUM(L16..L19)  
 M20: @SUM(M16..M19)  
 N20: @SUM(N16..N19)  
 G22: 8013-329  
 F22: +E22-G22  
 P22: @SUM(H22..O22)  
 Q22: +G22+P22  
 D23: +E23-C23  
 D25: @SUM(D21..D24)  
 F23: +E23-G23  
 F25: @SUM(F21..F24)  
 P23: @SUM(H23..O23)  
 Q23: +G23+P23  
 Q25: @SUM(Q21..Q24)  
 C25: @SUM(C21..C24)  
 E25: @SUM(E21..E24)  
 G25: @SUM(G21..G24)  
 H25: @SUM(H21..H24)  
 I25: @SUM(I21..I24)  
 J25: @SUM(J21..J24)  
 K25: @SUM(K21..K24)  
 L25: @SUM(L21..L24)  
 M25: @SUM(M21..M24)  
 N25: @SUM(N21..N24)

Q31: @SUM(Q26..Q30)  
 C31: @SUM(C26..C30)  
 E31: @SUM(E26..E30)  
 G31: @SUM(G26..G30)  
 H31: @SUM(H26..H30)  
 I31: @SUM(I26..I30)  
 J31: @SUM(J26..J30)  
 K31: @SUM(K26..K30)  
 L31: @SUM(L26..L30)  
 M31: @SUM(M26..M30)  
 N31: @SUM(N26..N30)  
 O31: @SUM(O26..O30)  
 P31: @SUM(P26..P30)  
 D33: +E33-C33  
 G33: 2564+51  
 F33: +E33-G33  
 P33: @SUM(H33..O33)  
 Q33: +G33+P33  
 D34: +E34-C34  
 G34: 4606+92  
 F34: +E34-G34  
 P34: @SUM(H34..O34)  
 Q34: +G34+P34  
 D35: +E35-C35  
 G35: 4491-51-92-119-6-15-32-73-10-12  
 F35: +E35-G35  
 P35: @SUM(H35..O35)  
 Q35: +G35+P35  
 D36: +E36-C36  
 G36: 5951+119  
 F36: +E36-G36  
 H36: -119+12  
 P36: @SUM(H36..O36)  
 Q36: +G36+P36  
 D37: +E37-C37  
 G37: 282+6  
 F37: +E37-G37  
 P37: @SUM(H37..O37)  
 Q37: +G37+P37  
 D38: +E38-C38

G38: 728+15  
 F38: +E38-G38  
 P38: @SUM(H38..O38)  
 Q38: +G38+P38  
 D39: +E39-C39  
 G39: 1605+32  
 F39: +E39-G39  
 L39: -10-19  
 P39: @SUM(H39..O39)  
 Q39: +G39+P39  
 F41: +E41-G41  
 P41: @SUM(H41..O41)  
 Q41: +G41+P41  
 D42: +E42-C42  
 D44: @SUM(D32..D43)  
 D46: +D10+D12+D13+D20+D25+D31+D44  
 G42: 613+12  
 F42: +E42-G42  
 F44: @SUM(F32..F43)  
 F46: +F10+F12+F13+F20+F25+F31+F44  
 P42: @SUM(H42..O42)  
 Q42: +G42+P42  
 Q44: @SUM(Q32..Q43)  
 Q46: +Q10+Q12+Q13+Q20+Q25+Q31+Q44  
 C44: @SUM(C32..C43)  
 C46: +C10+C12+C13+C20+C25+C31+C44  
 E44: @SUM(E32..E43)  
 E46: +E10+E12+E13+E20+E25+E31+E44  
 G44: @SUM(G32..G43)  
 G46: +G10+G12+G13+G20+G25+G31+G44  
 H44: @SUM(H32..H43)  
 H46: +H10+H12+H13+H20+H25+H31+H44  
 I44: @SUM(I32..I43)  
 I46: +I10+I12+I13+I20+I25+I31+I44  
 J44: @SUM(J32..J43)  
 J46: +J10+J12+J13+J20+J25+J31+J44  
 K44: @SUM(K32..K43)  
 K46: +K10+K12+K13+K20+K25+K31+K44  
 L44: @SUM(L32..L43)  
 L46: +L10+L12+L13+L20+L25+L31+L44  
 M44: @SUM(M32..M43)  
 M46: +M10+M12+M13+M20+M25+M31+M44  
 N44: @SUM(N32..N43)  
 N46: +N10+N12+N13+N20+N25+N31+N44  
 O44: @SUM(O32..O43)  
 O46: +O10+O12+O13+O20+O25+O31+O44  
 P44: @SUM(P32..P43)  
 P46: +P10+P12+P13+P20+P25+P31+P44  
 D49: +E49-C49  
 F49: +E49-G49  
 P49: @SUM(H49..O49)  
 Q49: +G49+P49  
 D50: +E50-C50  
 D40: +E40-C40  
 G40: 3632+73  
 F40: +E40-G40  
 P40: @SUM(H40..O40)  
 Q40: +G40+P40  
 D41: +E41-C41  
 G41: 496+10

A	B	C	D	E	F	G	H	I	J	K	L	M
FY95 STATUS OF FUNDS: CDC												
			Operations (CDOP)	PW Services (CDPW)	Labor (CDOP)	Total					Admin Travel (ATTR)	
Annual Planning Figure			120,000.00	80,000.00	565,000.00	765,000.00					0.00	
Authorization												
1ST QTR			30,000.00	20,000.00	135,000.00	185,000.00						
2ND QTR			30,000.00	20,000.00	140,000.00	190,000.00						
3RD QTR			35,000.00	20,000.00	145,000.00	200,000.00					11,000.00	
4TH QTR						0.00						
YTD AUTH AS OF:		19-Apr-95	95,000.00	60,000.00	420,000.00	575,000.00					11,000.00	
OBLIGATION EXPENSE CATEGORY			Operations	PW Services	Labor	Total					Admin Travel	
Civilian Personnel												
Training												
Travel of Personnel												
Transp of Things												
Rents & Utilities				10,867.41	305,153.31	305,153.31						
Communications				6,104.58		6,104.58					6,621.73	
Supplies			32,261.18			32,261.18						
Equipment (<\$15K)						0.00						
Maintenance & Repair				12,300.48		12,300.48						
Custodial						0.00						
Contracts						0.00						
Minor Construction						0.00						
All Other Expenses			6,909.98	2,316.55		9,226.53					2,529.50	
TOTAL EXPENSES AS O		26-Apr-95	39,171.16	31,589.02	305,153.31	375,913.49					9,151.23	
REMAINING BALANCE			55,828.84	28,410.98	114,846.69	199,086.51					1,848.77	

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A	B	C	D	E	F	G	H	I	J	K	L	M
		FY95 LABOR STATUS OF FUNDS BY PAY PERIOD										
		END STRENGTH	HOURS	LABOR	OVERTIME	AWARDS	TOTAL					
	CIVILIAN PERSONNEL											
	PAY PERIOD ENDING											
	Annual Planning Figure											
	10/15/94	21	1,361.4	20,439.20			20,439.20					20,439.20
	10/29/94	22	1,527.8	23,377.62			23,377.62					23,377.62
	11/12/94	21	1,313.6	20,349.59	98.83		20,448.42					20,448.42
	11/26/94	21	1,230.0	19,108.90			19,108.90					19,108.90
	12/10/94	20	1,429.5	22,226.80	83.10	129.00	22,438.90					22,438.90
	12/24/94	21	1,549.2	23,803.00			23,803.00					23,803.00
	01/07/95	20	1,038.2	15,970.45			15,970.45					15,970.45
	01/21/95	21	1,342.5	21,169.71		171.00	21,340.71					21,340.71
	02/04/95	22	1,415.5	21,874.25	39.13	171.00	22,084.38					22,084.38
	02/18/95	22	1,534.0	24,096.94	32.21		24,129.15					24,129.15
	03/04/95	21	1,338.3	20,929.18		1,542.00	22,471.18					22,471.18
	03/18/95	21	1,485.8	23,250.30			23,250.30					23,250.30
	04/01/95	21	1,554.2	24,471.10			24,471.10					24,471.10
	04/15/95	21	1,379.3	21,738.74	81.26		21,820.00					21,820.00
	04/29/95						0.00					0.00
	05/13/95						0.00					0.00
	05/27/95						0.00					0.00
	06/10/95						0.00					0.00
	06/24/94						0.00					0.00
	07/08/95						0.00					0.00
	07/22/95						0.00					0.00
	08/05/95						0.00					0.00
	08/19/95						0.00					0.00
	09/02/95						0.00					0.00
	09/16/95						0.00					0.00
	09/30/95						0.00					0.00
	TOTAL LABOR EXPENSE		19,499.3	302,805.78	334.53	2,013.00	305,153.31					
	REMAINING BALANCE			258,327.22	(334.53)	1,854.00						

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Formulas

Current file

J5: @NOW  
J14: @SUM(D14..H14)  
J17: @SUM(D17..I17)  
J18: @SUM(D18..I18)  
J19: @SUM(D19..I19)  
J20: @SUM(D20..I20)  
J22: @SUM(J15..J21)  
D22: @SUM(D15..D21)  
F22: @SUM(F15..F21)  
H22: @SUM(H15..H21)  
L22: @SUM(L15..L21)  
L92: @SUM(L64..L91)  
L94: +L63-L92  
J78: 22.56+58.7  
J67: 65.89+32.94  
J92: @SUM(J64..J91)  
J94: +J63-J92  
H78: 21820-22.56-58.7  
M78: @SUM(H78..L78)  
H74: 24129.15-32.21  
M74: @SUM(H74..L74)  
H73: 21913.38-39.13  
M73: @SUM(H73..L73)  
H72: 21421.08-251.37  
M72: @SUM(H72..L72)  
H69: 22309.9-83.1  
M69: @SUM(H69..L69)  
H67: 20448.42-98.83  
H92: @SUM(H64..H91)  
H29: +H92+J92+L92  
J29: @SUM(D29..I29)  
J30: @SUM(D30..I30)  
J31: @SUM(D31..I31)  
J32: @SUM(D32..I32)  
J33: @SUM(D33..I33)  
J34: @SUM(D34..I34)  
D35: 23987.07+8274.11  
J35: @SUM(D35..I35)  
J36: @SUM(D36..I36)  
F37: 1777.18+10523.3

J37: @SUM(D37..I37)  
J38: @SUM(D38..I38)  
J39: @SUM(D39..I39)  
J40: @SUM(D40..I40)  
D41: 1698.06+3211.92+2000  
J41: @SUM(D41..I41)  
J43: @SUM(J27..J42)  
J45: +J22-J43  
D43: @SUM(D27..D42)  
D45: +D22-D43  
F43: @SUM(F27..F42)  
F45: +F22-F43  
H43: @SUM(H27..H42)  
H45: +H22-H43  
L43: @SUM(L27..L42)  
L45: +L22-L43  
H63: 565000-2325-1542  
H94: +H63-H92  
M65: @SUM(H65..L65)  
M66: @SUM(H66..L66)  
M67: @SUM(H67..L67)  
M68: @SUM(H68..L68)  
M70: @SUM(H70..L70)  
M71: @SUM(H71..L71)  
M75: @SUM(H75..L75)  
M76: @SUM(H76..L76)  
M77: @SUM(H77..L77)  
M79: @SUM(H79..L79)  
M80: @SUM(H80..L80)  
M81: @SUM(H81..L81)  
M82: @SUM(H82..L82)  
M83: @SUM(H83..L83)  
M84: @SUM(H84..L84)  
M85: @SUM(H85..L85)  
M86: @SUM(H86..L86)  
M87: @SUM(H87..L87)  
M88: @SUM(H88..L88)  
M89: @SUM(H89..L89)  
M90: @SUM(H90..L90)  
F92: @SUM(F64..F91)  
M92: @SUM(H92..L92)



## LIST OF REFERENCES

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