

Spreadsheets: origin and workings

In the realm of accounting jargon a "spread sheet" or spreadsheet was and is a large sheet of paper with columns and rows that lays everything out about transactions for a business person to examine. It spreads or shows all of the costs, income, taxes, etc. on a single sheet of paper for a manager to look at when making a decision.

Spreadsheets have been used by accountants for hundreds of years. Computerized spreadsheets are of much more recent origin. Information Systems oral history and some published newspaper and magazine stories celebrate Dan Bricklin as the "father" of the electronic spreadsheet.

In 1978, Harvard Business School student, Daniel Bricklin, came up with the idea for an interactive visible calculator. Bricklin and Bob Frankston then co-invented or co-created the software program VisiCalc, compressed form of the phrase "visible calculator". We can look back and recognize that VisiCalc was the first "killer" application for personal computers.

The tale of VisiCalc is part myth and part fact for most of us. The story is that Dan Bricklin was preparing a spread sheet analysis for a Harvard Business School "case study" report and had two alternatives: 1) do it by hand or 2) use a clumsy time-sharing mainframe program. Bricklin thought there must be a better way. He wanted a program where people could visualize the spreadsheet as they created it. His metaphor was "an electronic blackboard and electronic chalk in a classroom."

By the fall of 1978, Bricklin had programmed the first working prototype of his concept in integer basic. The program helped users input and manipulate a matrix of five columns and 20 rows. The first version was not very "powerful" so Bricklin recruited an MIT acquaintance Bob Frankston to improve and expand the program. Bricklin calls Frankston the "co-creator" of the electronic spreadsheet. Frankston created the production code with faster speed, better arithmetic, and scrolling. He also expanded the program and "packed the code into a mere 20k of machine memory, making it both powerful and practical enough to be run on a microcomputer".

During the fall of 1978, Daniel Fylstra, founding Associate Editor of Byte Magazine, joined Bricklin and Frankston in developing VisiCalc. Fylstra, also an MIT/HBS graduate, was "marketing-oriented" and suggested that the product would be viable if it could run on an Apple micro-computer.

VisiCalc became an instant success and provided many business people with an incentive to purchase a personal computer or an H-P 85 or 87 calculator.

About 1 million copies of the spread-sheet program were sold during VisiCalc's product lifetime.

The market for electronic spreadsheet software was growing rapidly in the early 1980s which saw the introduction of the IBM PC. During this period, Mitch Kapor developed Lotus and his spreadsheet program quickly became the new industry spreadsheet standard. Lotus 1-2-3 made it easier to use spreadsheets and it added integrated charting, plotting and database capabilities. Lotus 1-2-3 established spreadsheet software as a major data presentation package as well as a complex calculation tool. It was also the first spreadsheet to introduce naming cells, cell ranges and spreadsheet macros.

The next milestone was the Microsoft Excel spreadsheet. Excel was originally written for the 512K Apple Macintosh in 1984-1985. Excel was one of the first spreadsheets to use a graphical interface with pull down menus and a point and click capability using a mouse pointing device. The Excel spreadsheet with a graphical user interface was easier for most people to use than the command line interface of PC-DOS spreadsheet products.

When Microsoft launched the Windows OS environment in 1987, Excel was one of the first application products released for it. When Windows finally gained wide acceptance with Version 3.0 in late 1989 Excel was Microsoft's flagship product. For nearly 3 years, Excel remained the only Windows spreadsheet program and it has only received competition from other spreadsheet products since the summer of 1992. Nonetheless Microsoft Excel still is the spreadsheet market leader.

But how do spreadsheets work? As said above, a spreadsheet is the computer equivalent of a paper ledger sheet. It consists of a grid made from columns and rows. It is an environment that can make number manipulation easy and somewhat painless.

The math that goes on behind the scenes on the paper ledger can be overwhelming. Let's suppose we want to buy a car and we ask for a loan of \$12,000.00 at an interest rate of 9.60% and in 60 payments. This amounts to a monthly payment of \$252.61. If you change the loan amount, you will have to start the math all over again (from scratch).

But not with a computer version.

The nice thing about using a computer and spreadsheet is that you can experiment with numbers without having to re-do all the calculations. What if we change the interest rate and then the number of months. Let the computer do the calculations! Once we have the formulas setup, we can change the variables that are called from the formula and watch the changes. Do that on paper and

you better get your calculator back out and get an eraser and hope you punched all the right keys and in the right order. Spreadsheets are instantly updated if one of the entries is changed.

Spreadsheets are very valuable tools in business. They are often used to play out a series of *what-if* scenarios! (much like our car purchase here.)

So let's start digging into what makes a spreadsheet work. Spreadsheets are made up of **columns** and **rows** and their intersections are called **cells**.

A column is defined as the vertical space that is going up and down the window. Columns are designated by letters: A, B, C etc.

A row is defined as the horizontal space that is going across the window. Rows are designated by numbers: 1, 2, 3 etc.

A cell is defined as the space where a specified row and column intersect. Each cell is assigned a name according to its column letter and row number e.g. C25, F230 etc.

Three basic types of data can be entered into a cell: **labels**, **constants** and **formulas**.

Labels are text entries. They do not have a value associated with them. We typically use labels to identify what is being done. The labels are not for the computer but rather for us so we can clarify what we are doing.

Constants are entries that have a specific fixed value. If someone asks you how old you are, you would answer with a specific number. Sure, other people will have different answers, but it is a fixed value for each person.

There may be different types of numbers. Sometimes constants are referring to dollars, sometimes referring to percentages, and other times referring to a number of items. These are typed into the computer with just the numbers and are changed to display their type of number by formatting.

Formulas are entries that have an equation that calculates the value to display. We DO NOT type in the numbers we are looking for, this is the job of the spreadsheet; we type in the equation. This equation will be updated upon the change or entry of any data that is referenced in the equation.

Formulas are apparently hidden inside the cell since only the results of the formula are visible. However clicking on a cell that contains a formula will show it in the formula bar or double clicking on the cell the formula will be shown in the cell itself.

Formulas OR **Functions** are mathematical equations. They must begin with an equal sign (=).

There is a list of the functions available within Excel under the **menu INSERT** down to *Function*

When we are entering formulas into a spreadsheet we want to make as many references as

possible to existing data. If we can reference that information we don't have to type it in again. And more importantly if that other information changes, we do not have to change the equations.

It is best if we can *Reference* as much data as possible as opposed to typing data into equations.

Spreadsheets have many Math functions built into them. Of the most basic operations are the standard multiply, divide, add and subtract. These operations follow the order of operations (just like algebra). Let's look at some examples. For these following examples let's consider the following data: A1 (column A, row 1) = 5; A2 = 7; A3 = 8; B1 = 3; B2 = 4; B3 = 2

Probably the most popular function in any spreadsheet is the SUM function. The Sum function takes all of the values in each of the specified cells and totals their values. The syntax is:
=SUM(first value, second value, etc)

In the first and second spots you can enter any of the following (constant, cell, range of cells).

Blank cells will return a value of zero to be added to the total, but text cells can not be added to a number and will produce an error.

There are many functions built into spreadsheets. The **Average** function finds the average of the specified data. (Simplifies adding all of the indicated cells together and dividing by the total number of cells.) The syntax is as follows:

=Average (first value, second value, etc.); **Max** (which stands for Maximum), will return the largest (max) value in the selected range of cells; **Min** (minimum), will return the smallest (Min) value in the selected range of cells; **Count** which will return the number of entries (actually counts each cell that contains number data) in the selected range of cells.

As before with the SUM function text and blank entries are not included in the calculations of all these functions..

Selecting cells is a very important concept of a spreadsheet. We need to know how to reference the data in other parts of the spreadsheet. When entering your selection you may use the keyboard or the mouse. We can select several cells together if we can specify a starting cell and a stopping cell. This will select ALL the cells within this specified BLOCK of cells.

Sometimes when we enter a formula, we need to repeat the same formula for many different cells. Copy and paste can be used but the cell locations in the formula are pasted relative to the position we copied them from. If in the original cell (C1) the equation was (A1+B1), when we paste the function it will look to the two cells to the left, that is the equation pasted into (C2) would be (A2+B2)

1. Understanding the passage.

Decide whether the following statements are true or false (T/F) by referring to the information in the text. Then make the necessary changes so that the false statements become true.

- 1.- A spreadsheet is a large blank sheet of paper used for hundreds of years.
- 2.- It is said that a Yale student invented Excel, the first electronic spreadsheet.
- 3.- To write this electronic spreadsheet, consisting of 5 rows and 20 columns he used machine code
- 5.- Kapor's Visicalc and Bricklin's Lotus 1-2-3 set the basis for today's powerful spreadsheets.
- 6.- A spreadsheet is an easy way of showing data resulting from complex calculations
- 7.- Excel constituted a major step in spreadsheet design for using modern interfaces.
- 8.- Cells are designated by the combination of column and row. Thus cell D24 indicates the place where row D intersects with column 24.
- 9.- Both constants and labels are used in spreadsheets for the calculations.
- 10.- Only the four basic Math functions can be used in spreadsheets

2. Answer these questions.

- 1.- Is the spreadsheet concept something new? Explain
- 2.- What made Dan Bricklin think about a computerized spreadsheet?
- 3.- Was Dan Bricklin alone in the development of Visicalc? Explain
- 4.- In what respects was Lotus 1-2-3 a better spreadsheet than Visicalc?
- 5.- What improvements did Excel show over Lotus 1-2-3?
- 6.- What are the advantages of electronic spreadsheets over traditional ones?
- 7.- Which parameters are used to identify/designate cells?
- 8.- What type of data is used for spreadsheets to perform the calculations?
- 9.- When you open a spreadsheet in which there are several calculations what type of information is visible on opening? How would you access the information which is not visible on opening?
- 10.- What happens when you add the contents of several cells and one of them contains instead of a number a letter or word?

3. Locating information

Find the passages in the text where the following ideas are expressed. Give the line references.

- 1.- Paper spreadsheets have been used for centuries but electronic spreadsheets are relatively new.
- 2.- A student created the first electronic spreadsheet to easily solve his practical work assignment.
- 3.- Bricklin's first efforts in the design of his spreadsheet achieved only poor results.
- 4.- To attain a better product Bricklin asked some friends for help.
- 5.- The next electronic spreadsheet in time added ways of showing graphically the results of the calculations.
- 6.- Excel was the first Windows spreadsheet.

4. Understanding words

Find synonyms(1-5) and antonyms (6-10) for the following words.

- | | |
|---------------------|------------------------|
| 1. language (l.1-5) | 6. small (l. 1-5) |
| 2. story (l. 22-23) | 7. multiple (l.5-7) |
| 3. autumn (l.32-34) | 8. forward (l. 19-21) |
| 4. friend (l.36-38) | 9. excellent (l.23-27) |
| 5. rise (l.57-59) | 10. large (l.40-44) |

5. Referents

Look back at the text of the unit and find the referents of the words in bold typeface in the sentences below.

1. **It** spreads or shows all (l. 5)
2. **He** also expanded (l. 42)
3. making **it** both powerful and (l. 44)
4. early 1980s **which** saw (l. 57)
5. Lotus 1-2-3 made **it** easier to use (l. 62)
- 6 **This** amounts to a monthly (l. 97)
7. and **their** intersections are (l. 118)
8. **These** are typed into (l. 144)
9. **this** is the job of the (l. 149)
10. will show **it** in the (l. 156)

PART II Answer the following macro questions.

- 1.-Make a table showing the changes in spreadsheets through time. Give as much detail as possible.
- 2.- Indicate the functions mentioned in the text that spreadsheets have, and what each function does.
- 3.- Task 1: If you work for 20 hours and make \$10 an hour, how much do you make? Work out this situation making a table simulating a spreadsheet and using a) three labels, b) two constants, c) one equation. (Type in references i.e the locations of the data that we want to use in our equation, instead of the data)
- 4.- Task 2: Make a grid/table to show the values in lines 178-177. In A4 show the result of adding the cells A1 to A3; In B4 show the result of adding B1-B3; In C1 show the result of multiplying A1 x B1; in C2 the result of subtracting B2 from A2; in C3 the result of dividing A3 by B3 and finally in C4 the result of adding A4 plus B4. Show, too, the hidden formulas to be applied in the appropriate cells.
- 5.- Find in the text examples of comparison, state their linguistic markers and also the ideas compared. Indicate the degree used in the comparisons. (higher degree, similarity, highest degree or parallel increase).

Council of Europe calls for free Internet
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The Council of Europe has called for a renewed commitment to the protection of Internet freedom. In a 'Declaration of freedom of communication on the Internet' the Council set out seven principles for its 45 member states, including the UK, to adhere to.

Central to these principles is the idea that the exchange of information over the Internet should be subject to no more restrictions than on other media and that control should, on the whole, be exercised through self-regulation. 'Public authorities should not, through general blocking or filtering measures, deny access by the public to information and other communication on the Internet, regardless of frontiers.' Although controls on illegal content, such as child pornography, remain justified.

The principles also call on member states to 'foster and encourage access for all to Internet communication and information services on a non-discriminatory basis at an affordable price'. There should be no restrictions on individuals setting up their own Web sites.

The Council has also come to the aid of Internet service providers, who are under increasing pressure to take responsibility for - and consequently police - the Web content that passes through them.

'Member states should not impose on service providers a general obligation to monitor content on the Internet to which they give access, that they transmit or store, nor that of actively seeking facts or circumstances indicating illegal activity.

'Member states should ensure that service providers are not held liable for content on the Internet when their function is limited, as defined by national law, to transmitting information or providing access to the Internet.'

The Council of Europe is an intergovernmental organisation which aims, among other things, to protect human rights, pluralist democracy and the rule of law. Every European state is a member, with the exception of Belorussia and the Vatican.