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A History of Microcomputer Spreadsheets

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ABSTRACT

In 1978, the first microcomputer spreadsheet program was developed. Since then spreadsheets have become widely used as productivity software for business and home computer users. Many of today's MIS faculty members use a variety of spreadsheet programs, but the origins and evolution of this product category is of on-going interest to students, managers and MIS faculty. This article is a contemporary history of microcomputer spreadsheets based on primary and secondary sources.

Keywords: spreadsheet, VisiCalc, Lotus 1-2-3, Excel, VP Planner, Twin, business analysis, analytical tools

I. INTRODUCTION

Quantitative analysis of data, especially accounting data, was organized using a multiple column, spreadsheet format for more than a hundred years. Beginning in the mid-1960s, software for mainframe computers was used for automating accounting and financial spreadsheet calculations [cf., Mattessich and Galassi, 1999]. By the mid-1970s, microcomputers were developed and in 1978 the first microcomputer spreadsheet software was developed. Microcomputer spreadsheet software evolved quickly and it has become a widely accepted and used tool for business analysis and for personal data recording and analysis.

According to Information Systems oral history and some published newspaper and magazine stories, Dan Bricklin is the "father" of the personal computer electronic spreadsheet. At some point in 1978, Harvard Business School student, Dan Bricklin, had an idea for an interactive visible calculator. Bricklin and Bob Frankston then co-invented or co-created the software program called VisiCalc. Frankston notes, "the statement that Dan came up with VisiCalc is not at all an exaggeration" [Frankston, April 15, 1999b]. Most observers identify VisiCalc as the first "killer" application for personal computers.
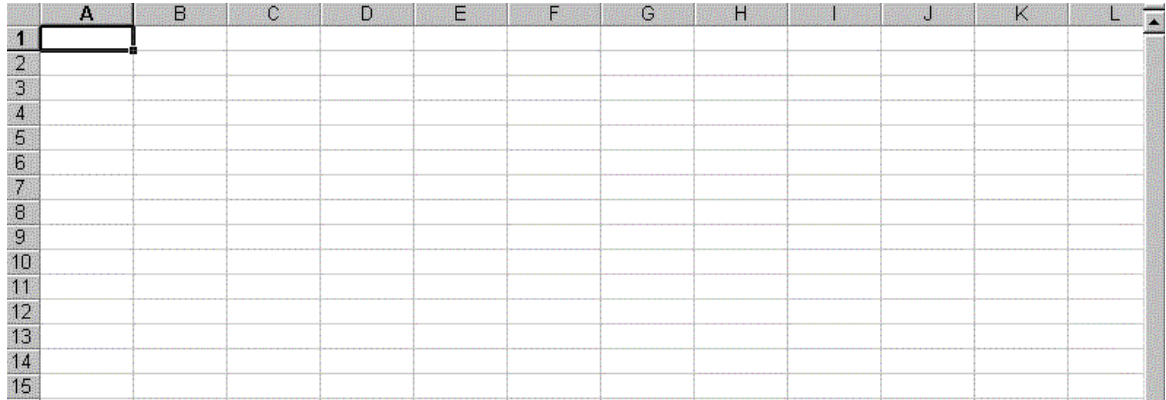
Much of the development of spreadsheets occurred as current senior Information Systems academics and practitioners taught about them and used them. An initial Web document titled "A Brief History of Spreadsheets" based on magazine articles and other secondary documents provided the starting point for gathering knowledge for this contemporary history of microcomputer spreadsheets. Version 1.0 was published on the Web October 14, 1996. Various versions of that Web document have been read by thousands of visitors to URL dss.cba.uni.edu and to URL DSSResources.COM. The interest in the topic and inquiries about the "facts" in it, led me to contact four major participants in the initial development of microcomputer spreadsheets to provide feedback on the Web document. Their email feedback is incorporated into this summary on the history of spreadsheets. The original Web document and email messages are on the Web at http://www.DSSResources.com.

Most of us know what spreadsheets are because we use them, but it seems appropriate to begin this written historical account with a definition and brief explanation of the software category called spreadsheets. Then this narrative presents a systematic record that begins with the pencil and paper roots of spreadsheets and mainframe spreadsheet applications, documents the development of the VisiCalc program and Software Arts, explains the origins of Lotus 1-2-3 and finally traces the Microsoft Excel story.

II. WHAT IS A SPREADSHEET?

Accounting jargon uses the term "spread sheet" or spreadsheet to mean a large sheet of paper with columns and rows that lays everything out about transactions for a person to examine. It spreads or shows data like costs, income, or sales on a single sheet of paper for a person to examine, especially when making a decision. A spreadsheet is a worksheet providing a two-way analysis of data.

An electronic spreadsheet organizes data into software-defined columns and rows (Fig. 1). The data can then be "added up" by a formula to give a total or sum. The basic spreadsheet screen display looks like a rotated "L". A spreadsheet program can summarize data from many sources and then present it in a meaningful format that can help people understand the data and make decisions.

Figure 1. A Spreadsheet Format.

III. BEGINNINGS AND THE "TALE OF VISICALC"

One can endlessly debate the beginnings of a concept or technology like spreadsheets. Both double-entry bookkeeping and matrix algebra are part of the paper and pencil roots of spreadsheets. In 1964, Richard Mattessich, a professor at the University of California at Berkeley, published some important concepts related to developing computerized spreadsheets for business accounting. His book *Simulation of the Firm through a Budget Computer Program* [Mattessich, 1964] included spreadsheet formatted outputs from programs written in Fortran IV [cf., Mattessich, 1999]. Some historical information on the computerization of

accounting spreadsheets is discussed on Mattessich's [1998] Web page *Spreadsheet: Its First Computerization (1961-1964).* Mattessich's work was important, but the mainframe accounting spreadsheet programs developed in the 1960s and 1970s were difficult and time consuming to use. This brief history does not try to document mainframe spreadsheet programs and fourth generation planning software like IFPS (Interactive Financial Planning System). Rather the focus is on PC spreadsheets. What most people think of as an electronic spreadsheet begins with the "Tale of VisiCalc". There is no evidence that Mattessich's work influenced the VisiCalc developers, Dan Bricklin and Bob Frankston.

TALE OF VISICALC

The story of the origins of VisiCalc or the "Tale of VisiCalc" is part myth and part fact. The story is that Dan Bricklin was preparing a spreadsheet analysis for a Harvard Business School "case study" report and had two alternatives:

1. do it by hand or
2. use a time-sharing mainframe program.

Bricklin thought there must be a better way. He wanted a computer program where people could see or visualize a spreadsheet as it was created. His metaphor was "an electronic blackboard and electronic chalk in a classroom."

Cringely [1992] tells a slightly different story about the origins of VisiCalc. He reports that Bricklin's Production Management professor at Harvard Business School "described large blackboards that were used in some companies for production planning. These blackboards, often so long that they spanned several rooms, were segmented into a matrix of rows and columns." Cringely notes "Each cell on the blackboard was located in both a column and a row, so each had a two-dimensional address. Some cells were related to others, so if the number of workers listed in cell C-3 was increased, it meant that the amount of total wages in cell C-5 had to be increased proportionally, as did the total number of items produced, listed in cell C-7. Changing the value in one cell required the recalculation of values in all other linked cells, which took a lot of erasing and a lot

of recalculating and left planners constantly worried that they had overlooked recalculating a linked value, making their conclusions incorrect. (pp. 65-66)"

Bricklin acknowledges many influences on his thinking at the time. He notes in an email [Bricklin, 1999], "As to the story of coming up with the idea and refining it into a product, I have the beginnings on my site … and Bob and I are working on more information about design decisions, exactly what happened, etc. Since we were often the only ones there, I hope you'll put some trust in our story …".

Either way the story is told, by the fall of 1978, Bricklin had programmed the first working prototype of his concept in Apple][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 was also an MIT/HBS graduate. Fylstra was "marketing-oriented" and suggested that the product would be viable if it could run on an Apple microcomputer. Bricklin and Frankston formed Software Arts Corporation on January 2, 1979. In May 1979, Fylstra and his firm Personal Software (later renamed VisiCorp) began marketing "VisiCalc" with a pre-release teaser ad in *Byte Magazine*. The name "VisiCalc" was chosen for the product as a compressed form of the phrase "visible calculator" (see email from Frankston, 4/15/1999b).

VisiCalc became an almost instantaneous success and provided many business people with an incentive to purchase a personal computer. By 1981, VisiCalc was available for the new IBM PC and sales were approximately 30,000 copies per month. During VisiCalc's product lifetime about 500,000 copies were sold. Dan Bricklin has his version of the history of Software Arts and VisiCalc on

the Web at http://www.bricklin.com.   Bricklin's site includes early ads and reviews and pictures of the VisiCalc packaging and screenshots. VisiCalc provided a visual interface to a rows and columns matrix that was easy to use and affordable for managers and individuals. Repetitive calculations and "What if?" analysis became "almost fun" and they were definitely faster with VisiCalc than with other alternatives.

According to Microsoft co-founder Bill Gates, what VisiCalc "made possible was putting formulas behind each element in a table of data. These formulas could refer to other elements of the table. Any change in one value would immediately affect the other cells, so projections such as sales, growth, or changes in interest rates could be played with to examine 'what if' scenarios, and the impact of every change would be instantly apparent" [Gates 1995, p. 139].

Mitch Kapor noted in an email "I've always felt what gave VisiCalc its unique power and novelty was the way it married a user interface to the data model. I find it plausible that a data model consisting of a matrix of cells with formulas in them was not new to VisiCalc. However, the use of a direct interaction metaphor, which was enabled by the personal computer, was certainly new. The marriage of the two created the killer app" [Kapor, April 15, 1999].

IV. WHAT CAME NEXT? LOTUS 1-2-3

The market for electronic spreadsheet software was growing rapidly in the early 1980s and VisiCalc stakeholders were slow to respond to the introduction of the IBM PC that used an Intel computer chip. By 1982 Personal Computing Magazine listed eighteen spreadsheet programs. Most ran on the Apple or CP/M operating system. VisiCalc ran on those operating systems and PC-DOS. The list price of VisiCalc in 1982 was $250. Beginning in September 1983, legal conflicts between VisiCorp and Software Arts distracted the VisiCalc developers, Dan Bricklin and Bob Frankston. During this period, Mitch Kapor developed Lotus 1-2-3 and his spreadsheet program quickly became the new industry spreadsheet standard. In January of 1983, Kapor's new company introduced Lotus 1-2-3.

WHAT IS LOTUS 1-2-3?

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. Lotus was also the first spreadsheet vendor to introduce naming cells, cell ranges and spreadsheet macros. Kapor was the VisiCalc product manager at Personal Software for about six months in 1980; he also designed and programmed Visiplot/Visitrend which he sold to Personal Software (VisiCorp) for $1 million. Part of that money along with funds from venture capitalist Ben Rosen was used to start Lotus Development Corporation in 1982. Kapor cofounded Lotus Development Corporation with Jonathan Sachs. Before he cofounded Lotus, Kapor disclosed and offered Personal Software (VisiCorp) his initial Lotus program [Kapor, 04/15/1999]. Supposedly VisiCorp executives declined the offer because Lotus 1-2-3's functionality was "too limited". Lotus 1-2-3 remains one of the all-time best selling application software packages in the world.

Kapor served as the President and Chief Executive Officer of Lotus from 1982 to 1986 and as a Director until 1987. In 1983, Lotus' first year of operations, the company reported revenues of $53 million and had a successful public offering. In 1984, Lotus tripled in revenue to $156 million. The number of employees at Lotus grew to over a thousand by 1985. This rapid growth in sales led to a shakeout in the spreadsheet segment of the personal computer software industry.

In 1985, Lotus Development acquired Software Arts and discontinued the VisiCalc program. A Lotus spokesperson indicated following the acquisition "1-2-3 and Symphony are much better products so VisiCalc is no longer necessary." Lotus Symphony integrated a word processor, a "form" processor, and a telecommunications capability with spreadsheet, charting and database tools. By 1985 Lotus 1-2-3 was the best selling spreadsheet product. Other spreadsheet products included Framework, PFS Plan, Multiplan, and Excel. In 1987, Lotus 1-2-3 became available for the Apple Macintosh.

V. WHAT ABOUT MICROSOFT EXCEL AND BILL GATES?

The next milestone in the history of spreadsheets was the introduction of 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 through 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. Many people bought Apple Macintoshes so that they could use Bill Gates' Excel spreadsheet program.

Table 1. Key Dates in the History of Microsoft Excel

1985	Excel 1.0 launched
1986-88	Microsoft releases versions 1.0.6 and 1.5
10/31/87	Launch of Excel 2.0 for MS-DOS version 3.0
1989	Launch of Excel 2.2 for Macintosh. New version includes improvements in the calculation speed by 40% and added flexibility of different styles within a single document
12/9/90	Excel 3.0 is launched. This version includes Workbooks and is one of the earliest Macintosh applications to offer Users Publish & Subscribe functionality.
4/1/92	Microsoft Releases Excel 4.0 for Windows 3.1
11/1/92	Excel 4.0a for Windows 3.1
12/14/93	Excel 5.0; This version includes improved Workbooks and the replacement of Excel Macro Language with Visual Basic.
7/27/95	Excel 7.0 for Windows 95/NT.
1/15/97	Excel version 8 for Windows.
6/7/1999	Excel 2000 released.

Based on http://www.lboro.ac.uk/departments/ps/exceldir/excelhist.html; http://support.microsoft.com; and http://www.microsoft.com/presspass/press/1999/Jun99/OffLaunchpr.asp)

Table 1 summarizes key dates related to the Microsoft Excel product. There is some controversy about whether a graphical version of Microsoft Excel was released in a DOS version. Microsoft documents show the launch of Excel 2.0 for MS-DOS version 3.0 on October 31, 1987.

When Microsoft launched the Windows operating system 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. In the summer of 1992, Lotus Development Corporation released Lotus 1-2-3 version 1.0 for Windows 3.1.

By the late 1980s, many companies had introduced spreadsheet products. These products and the spreadsheet software industry were maturing. Microsoft and Bill Gates had joined the fray with the innovative Excel spreadsheet. Borland had introduced Quattro. Lotus had acquired Software Arts and the rights to VisiCalc. Jim Manzi had become CEO at Lotus in April 1986 and in July 1986 Mitch Kapor resigned as Chairman of the Board. The spreadsheet entrepreneurs were moving on and the marketing struggle was moving into high gear.

VI. LEGAL BATTLES

In January 1987, Lotus Development filed suit against Paperback Software and Mosaic Software claiming they had infringed on the Lotus 1-2-3 spreadsheet software. In a related matter, Software Arts, the developer of the original VisiCalc spreadsheet software filed a civil lawsuit against Lotus claiming that Lotus 1-2-3 was an infringement of the VisiCalc software. Briefly, Lotus won the legal battles, but lost the "market share war" to Microsoft. According to Russo and Nafziger [1993] "The Court granted Lotus' motion dismissing the Software Arts' action and confirming that Lotus had acquired all rights, including all claims, as part of the earlier transaction."

Most people have probably forgotten the Lotus clones called TWIN and VP Planner. Twin published by Mosaic Software was designed to work like Lotus 1-2-3. Advertising proclaimed it "offers you so much more, for so much less." Paperback Software published a spreadsheet software product called VP Planner. It evolved from James Stephenson's Financial Information and Planning System called FIPS. In December 1983 Stephenson and Adam Osborne reached an agreement to publish VP Planner. During 1984, they converted the program into a "workalike for 1-2-3".

Russo and Nafziger note "Both Mosaic's TWIN and Paperback's VP Planner had most of the same features, commands, macro language, syntax, organization and sequence of menus and messages as Lotus' 1-2-3. Their visual displays were not however identical to 1-2-3 or to each other. Both TWIN and VP Planner reorganized and placed their respective menus, sub-menus, prompts and messages on the bottom of the screen."

On June 28, 1990, Judge Robert E. Keeton of the United States District Court for the District of Massachusetts upheld the copyright for the Lotus 1-2-3 user interface. Keaton (1990) wrote that "the command structure of 1-2-3 is an original and nonobvious way of expressing a command structure. … I determine that copyrightability of the user interface of 1-2-3 is established." This ruling is an important precedent for user interface "look and feel" copyright disputes.

VII. WHAT ABOUT MORE RECENT HISTORY?

In the late spring of 1995, IBM acquired Lotus Development. During most of the 1990s, Microsoft Excel was the spreadsheet market share leader. Today, the major challenges to Microsoft seems to come from the Linux operating system environment and from Web Application Service Providers. Star Office and Applixware (www.applix.com) are examples of integrated office packages for Linux that include spreadsheet applications. StarOffice (www.sun.com/staroffice) is a fully-integrated and Microsoft Office-compatible suite of productivity applications. It includes a spreadsheet program similar to Excel and VisiCalc.

What about the key players from the early years? Dan Bricklin founded Trellix Corporation (www.trellix.com) and he is working on his newest innovation Trellix Web. Bricklin maintains an interesting personal Web Site at www.bricklin.com. The original VisiCalc software is at his personal site. Lotus gave Dan permission to post a working copy of the 1981 IBM PC version of the VisiCalc spreadsheet program on his Web site. You can download VisiCalc and run it on a PC using MS-DOS mode in Windows 95 or 98.

Bob Frankston is "pursuing a number of projects ..." Check his writings at www.frankston.com.

In a recent Red Herring Profile, Deborah Claymon [1999] says Mitch Kapor "has gradually traded in his position as an entrepreneur searching for the next big technology idea for the long-term advisory role of angel investor." In January 1999, Mitch Kapor joined Accel Partners, a venture capital firm based in Palo Alto, CA. Mitch's personal Web site is Kapor Enterprises, Inc. at www.kei.com.

Currently, Dan Fylstra is President of PC software vendor Frontline Systems, Inc. at www.frontsys.com. Frontline Systems Inc. is a developer of spreadsheet solver add-ins for Excel, Lotus 1-2-3 and other spreadsheet programs. Solver add-ins can be used for both solving equations and for constrained optimization using linear programming, nonlinear programming, and integer programming methods.

Richard Mattessich continues to write and participates in discussions on the history of spreadsheets. He is retired and an emeritus Professor of Commerce and Business Administration at the University of British Columbia.

Editor's Note: This article was received on October 1, 2000 and was published on October 26, 2000

VIII. REFERENCES

EDITOR'S NOTE: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that
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Readers may also want to search http://www.microsoft.com and http://www.lotus.com

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