

Spreadsheets - How It Started

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Summary

Spreadsheets are usually a complimentary solution, or even an alternative to complicated or poorly engineered information systems. They are the most frequent solution to the gap caused by different paces in evolution of business processes and upgrades of present, previously implemented information systems. Research suggests that about 90% of companies use spreadsheets in financial planning, budgeting, business forecasting, etc. This paper presents a research in progress, carried out by the authors as to determine actual reasons for using spreadsheets, as well ways they are used. The research methodology applied involves, among else, a stage dealing with exploring historical aspects of emergence and development of spreadsheets. Initial results of this stage are presented in the paper.

Keywords

spreadsheets, historical perspective, VisiCalc, Lotus 1-2-3, Microsoft Excel

1. Introduction

First used more than 3800 years ago, (Robson, 2001; Cipra, 2002; Columbia University, n.d), tables have become spreadsheets mid-twentieth century, predominantly to meet the requirements of bookkeeping (Jelen, 2005). Introduction of a vast number of mathematical techniques into bookkeeping (above all, development and use of the present value approach and wide use of accounting matrices) has caused spreadsheets to receive their electronic form during 1960s (Raković, 2014): the first electronic spreadsheet, developed by professor Mattessich, enabled user to perform “what-if” calculations, in order to ease problem solving for companies, which were often forced to redo certain calculations each time they made an alteration to a budget or a similar calculation (Mattessich, 2005; Raković, 2014).

However, due to a small number of available mainframe computers at the time, as well as the fact that the program required substantial technical skills (knowledge of Fortran programming language, in which the program was developed, was necessary for suing the program), it can be said that professor Mattessich, as the creator of the first spreadsheet program, was on the right track, but not at the right time, which is why he is often unfairly overlooked as the inventor if spreadsheet programs. Instead of him, the literature has grants the title of spreadsheet pioneers to Daniel Bricklin and Bob Frankston and their program, VisiCalc, developed in late 1970s (Bellis, 1999; Power, 2000; Browne, 2002; Kaparathi & Power, 2003; Power, 2004; Bender, 2004; Jelen, 2005; Computer History

Museum, 2006; Livingston, 2007; Ceruzzi & Grad, 2007; Walkenbach, 2010; McMullen, n.d.). Microsoft Multiplan, Lotus 1-2-3, Quattro and Microsoft Excel are often mentioned among programs with which it all began (Power, 2000; Browne, 2002; Kaparathi & Power, 2003; Power, 2004; Bender, 2004; Jelen, 2005; Livingston, 2007; Ceruzzi & Grad, 2007; Walkenbach, 2010; Anderson, 2013; Raković, 2014 etc.), while Jelen (2005) also mentions some less known, such as Supercalc, As Easy As, SynCalc, EasyPlanner, PFS Plan, The Twin, Javelin and Appleworks.

This research is focused on VisiCalc, Lotus 1-2-3 and Excel, due to the fact that they were pioneers in utilization of nascent hardware and/or software platforms of their time: Apple II, PC and Windows, respectively. For the same reason, Quattro was not studied in detail, although its contribution to the development of spreadsheets is unquestionable. The analyzed literature (Power, 2000; Browne, 2002; Kaparathi & Power, 2003; Power, 2004; Bender, 2004; Jelen, 2005; Livingston, 2007; Ceruzzi & Grad, 2007; Walkenbach, 2010 etc.) highlights three years when the mentioned applications appeared, and subsequently “ruled” the market of spreadsheet applications (Raković, 2104):

- 1979 – launch of VisiCalc.
- 1983 – launch of Lotus 1-2-3.
- 1985 – launch of Excel.

A Historical overview of the development of aforementioned applications is presented in Figure 1.

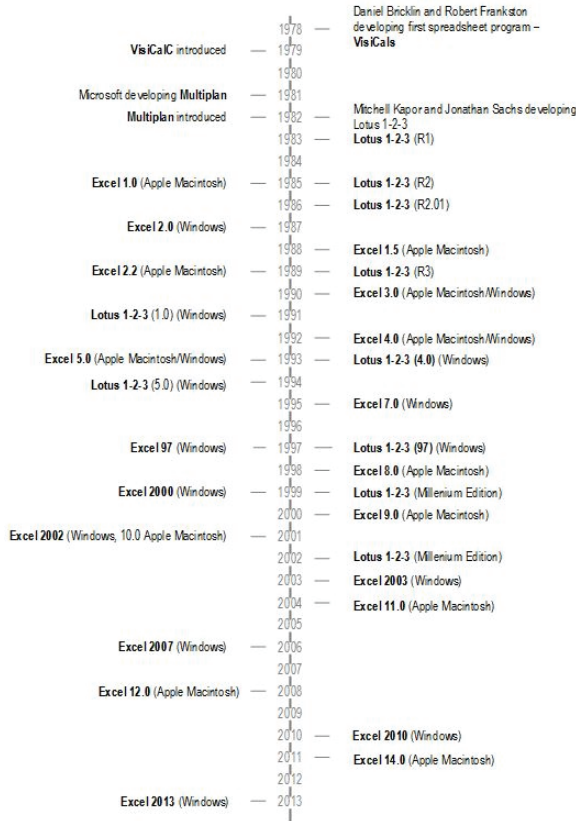


Figure 1 Most prominent spreadsheet applications – a historical overview

Source: based on Bricklin, 1999-2012; Pemberton & Robson, 2000; Power, 2000; Power, 2004; Jelen, 2005; Bricklin, 2009; Walkenbach, 2010; Anderson, 2013, mentioned in Raković, 2014.

2. VisiCalc

There are conflicting opinions on the ownership of the idea that led to the creation of VisiCalc and its subsequent market launch in 1979. According to one version, Daniel Bricklin, a student of Harvard Business School, came to an idea about an improved version of calculator while preparing for lectures: he was supposed to make numerous calculations, which needed to be repeated if the initial values were changed (Bricklin 1999-2012, 2009; Raković, 2014). Cringey (cited in Power, 2000), disputed Bricklin's claim and argued that Bricklin "borrowed" the idea from a lecture where a professor was describing big tables that were used for production planning in several companies.

Following advice from several of his professors to whom he had presented his idea, Bricklin added net present value, lookup and other financial functions to the developing software product (Bricklin, 1999-2012; Power, 2000; Power, 2004; Bricklin, 2009). The first version saw the light of day in 1978. It operated on Apple II computer, and could handle twenty rows and five columns. At that time, Bob Frankston joined the development

team (Bellis, 1999; Bricklin, 1999-2012, 2009; Power, 2000; Browne, 2002; Kaparthi & Power, 2003; Power, 2004; Bender, 2004; Jelen, 2005; Ceruzzi & Grad, 2007; Livingston, 2007; Bricklin, 2009; McMullen, n.d.). This led to the development of a 20 kB program (Frankston, 2012). At that time, performance anxiety was a common thing – "powerful" microcomputers were equipped with 32 kB of memory (48 kB somewhat later) (Bricklin, 1999-2012; Power, 2000; Power, 2004; Bricklin, 2009), while personal computers were equipped predominantly with a Basic interpreter, which required users to write their own programs, or to buy specific programs, which were scarce and had a very limited scope of application.

In 1979, Bricklin and Frankston founded their software company under the name "Software Arts" (Bricklin, 1999-2012; Bricklin, 2009). Distribution of their future product was entrusted to Personal Software Corporation (which later changed its name to VisiCorp), which was one of the greatest software companies at the time (Bricklin, 2009). The future product was named VisiCalc (abbreviated from Visible Calculator) (Bricklin, 1999-2012; Power, 2000; Power, 2004).

VisiCalc was presented at computer shows and conventions throughout mid-1979 (Bricklin, 1999-2012; Power, 2000; Power, 2004; Bricklin, 2009), which generated very positive effects. The statement made by Benjamin Rosen, one of the most prominent people in computing at that time, sums up the interest raised by VisiCalc: "So who knows? *Visicalc* could someday become the software tail that wags (and sells) the personal computer dog", meaning that people might buy computers because of VisiCalc (Browne, 2002; Bricklin, 2009; Bricklin, 1999-2012; McMullen, n.d.)

The first market edition of VisiCalc was labeled 1.37 and was launched on October 17, 1979, at a price of \$99.00. In a brown leather package, there was a 5¼ inch floppy disk, detailed user manual and a card with quick tips. 1,293 copies were sold by the end of October, and 4,258 were sold by the end of the year. This was followed by a significant increase in company's sales and revenue. In 1979, Personal Software had a revenue of \$882,000. In the following year, the revenue increased over four times (\$3.7 million). In 1981, it totaled around \$14 million, followed by \$22.6 million in 1982 (as cited in Rumelt, 2003). Late 1982 saw the launch of VisiCalc Advanced, with features such as variable column width, improved formatting and macros.

Accuracy of Benjamin Rosen's vision was corroborated by Steve Wozniak, one of the co-

founders of Apple Computers. He attributed the success of his company to the appearance of the floppy disk and VisiCalc software (Rumelt, 2003). Specifically, Apple Computers thought that Apple II computer would mostly serve as a home, “hobby” tool. However, due to VisiCalc, around 90% of Apple II computes was sold to small organizations (as cited in Rumelt, 2003). Anderson (2013) highlights that customers were coming to stores to purchase VisiCalc, and at the same time, looking for all that was necessary to run it.

Rumelt (2003) attributed the success of VisiCalc to three factors:

- VisiCalc enabled users with no programming experience to build quantitative models using computers;
- VisiCalc enabled users to instantly see the effect of changes made in the model;
- VisiCalc was a general-purpose application (which was rare at the time).

Unfortunately, the company did not properly respond to the emergence of PCs, whose era started in early 1980s. PC version of VisiCalc saw the light of day with a significant delay, which the competing application Lotus 1-2-3 took advantage of (Raković, 2014). In addition to that, VisiCalc’s loss of market share can also be ascribed to the conflict between companies that produced and distributed VisiCalc: Software Arts and VisiCorp (Kaparathi & Power, 2003; Livingston, 2007, Bricklin, 1999-2012). In September 1983, VisiCorp filed a lawsuit against Software Arts due to a delay in delivery of advanced versions of VisiCalc. The plaintiff demanded tens of millions of dollars in damages; in addition to that, VisiCorp decided that it should not pay for copyrights to Software Arts. Early in 1984, Software Arts filed a countersuit for breach of contract. It was only in summer 1984 that a settlement was reached, according to which VisiCorp had to pay for the copyrights for the previous period, as well as to refrain from using the VisiCalc trademark (Bricklin, 1999-2012, mentioned in Raković, 2014).

3. Lotus 1-2-3

Development of Lotus 1-2-3 is closely tied to VisiCalc. Mitchell Kapor worked as a project manager in VisiCalc. He developed and sold VisiCorp extensions for VisiCalc – VisiPlot and VisiTrend. After realizing the magnitude and potential for growth in the spreadsheet application market, he left VisiCalc in 1981, and together with

Jonathan Sachs, founded a company called Lotus Development in April 1982 (Power, 2000; Jelen, 2005; Ceruzzi & Grad, 2007; Walkenbach, 2010; Raković, 2014). They chose IBM PC as their platform, which later proved to be a good move. Lotus 1-2-3 enabled chart creation, as well as some database capabilities. It was the first program that supported operations on cell ranges, cell naming and macros (Browne, 2002; Kaparathi & Power, 2003; Power, 2004; Bender, 2004; Jelen, 2005; Livingston, 2007; Lazerus, 2007; Bricklin, 2009).

Lotus 1-2-3 and VisiCorp became a part of the story about a missed opportunity and lack of recognition for the potential, which later became typical for the IT industry. Kapor offered VisiCorp the initial version of Lotus 1-2-3, but was rejected under the explanation that functionalities of his software are too limited (Raković, 2014). At the beginning of 1983, Lotus 1-2-3 was presented to the public and, according to the testimony of the PC World magazine, it surpassed VisiCalc by the number of copies sold by October 1983 (as cited in Jelen, 2005). The fact that Lotus 1-2-3 was sold at \$495 (Walkenbach, 2010), which was a considerably higher price than that of VisiCalc, speaks to the magnitude of this achievement can be: VisiCalc cost \$199.95 in 1982, to be reduced to \$99.95 in 1983 (Reed, 2007). It can be said that 1983 was the first year of Lotus 1-2-3’s decade of dominance in the spreadsheet application market. The product generated a revenue of 53 million dollars just in the first year, which was almost tripled in the following year – an impressive 156 million dollars. (Power, 2004; Kapor, n.d.). Gregg Williams (as cited in Anderson, 2013), editor of Byte magazine, stated: “To date, computers have been hard to understand and inconvenient to use, which has discouraged many people from using them. 1-2-3 is one of the few pieces of software that can literally be used by anybody. You can buy 1-2-3 and an IBM Personal Computer and be using the two together the same day.”

The second version of the application came after two years, while the third appeared after additional five years. The third edition of Lotus 1-2-3 required a PC with at least 1 MB RAM, which was a bold requirement at the time. Walkenbach (2010) states that Lotus Development made a terrific move, since it didn’t replace version 2 with version 3 (version 3 was completely new), but instead also developed version 2.2. In such way, they successfully divided the market into two segments: the first comprised users with “regular” equipment (version 2.2), while the second

comprised users with state-of-the-art equipment (version 3).

Lotus Development bought Software Arts in 1985, and practically eliminated all completion by shutting down the development of VisiCalc. What VisiCalc was for Apple II, Lotus 1-2-3 was for IBM PC: for the second time, a spreadsheet program was the driving force that led to the significant growth in computer sales and put the whole computer industry into motion (Anderson, 2013). By April 1987, Lotus Development delivered 2.5 million copies of their software for personal computers (Lotus 1-2-3 was not the only application they developed) to 65 countries, localized into nine different languages. At the time, the company had more than 1,400 employees and permanent affiliations in numerous countries (Bellis, 1999; Kaparthi & Power, 2003; Power, 2004; Jelen, 2005; Lazerus, 2007; Bricklin, 2009).

However, the destiny of VisiCalc was similar to one of Lotus 1-2-3: just as Software Arts was unable to identify the upcoming market changes that came with the IBM PC, Lotus Development belatedly reacted to the appearance of Windows, and subsequently lost in a market competition with Microsoft. Windows appeared in 1985, while the first version of Lotus 1-2-3 for Windows was presented as late as in 1991, however, still with many flaws. In 1995, IBM bought Lotus Development; in 1997, they released Lotus 1-2-3 version 97, in 1998, Lotus 1-2-3 Millennium Edition (which was included in the SmartSuite Millennium Edition), while the last version (within SmartSuite 9.8) was published in 2002. Early in 2013, IBM announced that it would cease to provide customer support for Lotus 1-2-3 after June 2014 (Walkenbach, 2010; Anderson, 2013; Eyden, 2013; IBM, n.d.).

4. Microsoft Excel

In 1981, Microsoft began development of a spreadsheet program named Multiplan. The program was completed and presented to the public in 1982. However, Multiplan was unable to stand-up to the competition (VisiCalc and Lotus 1-2-3), and occupy a significant position in the market. Walkenbach (2010) sees the reason for this in the fact that Multiplan was difficult to learn and use.

In early 1984, leaders of Microsoft realized that something new was necessary to challenge the absolute dominance of Lotus 1-2-3. Therefore, they turned to the development of a new product, planned to be based on Apple II platform.

However, later on they opted for the 512 kB version of Macintosh, which caused a delay of nine months from the initial implementation plan. The new spreadsheet program, Excel, presented in 1985 (the name "Excel" was chosen a year before), became available on the market in September of the same year, at a launch price of \$385 (Allan, 2001).

Microsoft did not develop Excel for DOS – they still offered the (the same old) Multiplan for that operating system. In 1987, Microsoft released Excel 2.0 for Windows and ceased further development of Multiplan. Excel was the first spreadsheet application with a graphical user interface and use of pull-down menus (Jelen, 2005). Throughout the first three years of Windows operating system, Excel became its trademark (Power, 2000; Power, 2004), and a serious competitor to Lotus 1-2-3 (as well as to Quattro¹). However, Lotus 1-2-3 held on in the market competition until 1993. That year, sales of Excel surpassed Lotus 1-2-3 (Excel's market share was 45%, compared to 35% and 20% of Lotus 1-2-3 and Quattro, respectively), and ever since, it has been ruling the spreadsheet application market (Jelen, 2005). In their research on the use of spreadsheet programs, Pemberton & Robson (2000) state that the use of aforementioned programs expressed in percentages differs than the market structure: up to 1995, 65% of business users used Lotus 1-2-3, while MS Excel was used by 44% of users. After only three years, MS Excel took absolute dominance, with 79% of all spreadsheet users, compared to Lotus 1-2-3, which declined to 27%. Research conducted by the same authors in 2000 has proven the complete dominance of MS Excel in the spreadsheet applications market: 94% of users use MS Excel as the primary application for spreadsheet calculations, 5% used Lotus 1-2-3 and only 1% used Quattro Pro. According to data provided by Microsoft, their software package Office (which includes Excel), is used by over a billion people, which comes down to every seventh person on the planet (Microsoft, 2014). This fact might seem even more remarkable if we compare it with figures from previous years: in 2010, the number of Excel users was 500,000,000, compared to 30,000,000 people in 1996 (Microsoft, 1996, 2010).

¹ Walkenbach (2010) states that Quattro was a clone of Lotus 1-2-3, with some additional capabilities, improved menu system and a significantly lower price. However, just like Lotus, Borland was too late to move their spreadsheet program to Windows (Walkenbach, 2010).

Excel VBA (Visual Basic for Application) appeared in 1995, in Excel version 5. Ever since version 95, all the way to version 11.0, in spite of continuous improvements, Excel offered a similar interface. A revolutionary change in the user interface design came in 2006, in Excel version 2007. Development of Excel from a historical perspective is presented in Figure 1, while Evolution of its capabilities is presented in Figure 2

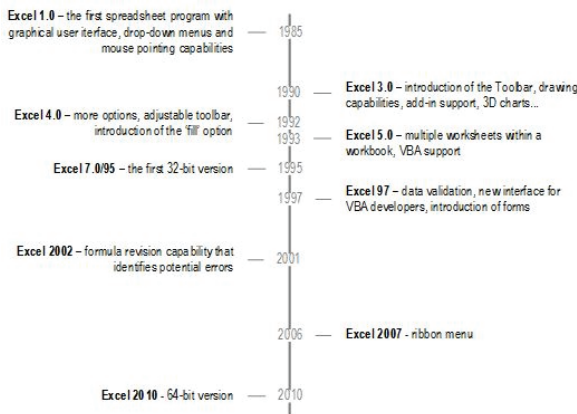


Figure 2 Evolution of capabilities of MS Excel
Source: based on Walkenbach 2010; Kaul, 2013

5. Instead of a Conclusion

Intensive introduction of mathematical models into accounting at the time when application of computers in the civilian domain amplified, resulted in development of computer spreadsheets during 1960s. However, mainframe computers did not prove to be a suitable hardware platform for the development of electronic spreadsheets. Spreadsheets were a big success due to the appearance of microcomputers, above all, Apple II and VisiCalc software in the late 1970s. Lotus 1-2-3 and the PC platform were the second double act that one again gave momentum to the popularization of spreadsheets during 1980s. MS Excel with the Windows graphic user interface appeared several years later, and has remained an undisputed ruler of the spreadsheet applications market until the present day. Based on research conducted by Raković (2014), the paper provides a brief overview of significant milestones in the historical development of these applications, without the intention to provide comprehensive and detailed information. Compete insight into this topic can be achieved only by studying numerous sources, which can even be contradictory.

Acknowledgement: This paper presents part of results of a research in progress, already presented in previous form in Raković (2014), which served as a basis for the research.

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