

Lecture 10. Computer at home and the personal computing paradigm

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Introduction: microcomputers for home

Volume manufacturing of microcomputers for commercial markets began in 1973. Microcomputers were primarily employed as embedded control systems (e.g. French Micral) but also as data processing units for business, research, and educational applications (e.g. Canadian MCM/70).

It was not before late 1970s, when general purpose microcomputers were manufactured in hundreds of thousands of units per year. This sudden demand for microcomputers was caused, in part, by the introduction of microcomputer hardware and software capable of supporting small business operations and computer literacy programs.

In 1977, Commodore introduced its all-in-one PET 2001 computer aimed at business while Apple Computer unveiled its Apple II which would soon attract a lot of attention from financial analysts and planners due to the popularity of the *VisiCalc* spreadsheet program developed for that computer by Personal Software Inc. A 'VisiCalc machine', i.e., an Apple running VisiCalc software, demonstrated that a microcomputer could be an effective, personal productivity tool that did not require any computer hardware or programming skills from its user.



Fig. 1. Commodore PET exhibit during Vintage Computer Festival, 2004. Photograph by Z. Stachniak.

But the main reason for the marked increase in microcomputer sales was the invention of a new consumer electronics gadget – the *home computer*.

Since 1977, a number of computer, semiconductor, and consumer electronics companies had begun to manufacture rudimentary but complete microcomputers for home applications and started to sell them in large quantities through chains of large department stores, dedicated computer stores, and, in some cases, through manufacturers' own retail outlets (for instance, by 1979, Tandy Corp. sold over 100,000 of its small TRS-80 Model 1 computers through its vast North American chain of outlets).

Apple Computer, Atari Inc., Commodore, Tandy Corp., and Texas Instruments were among the first companies to offer home computers but they were soon followed by numerous other firms, some of which had no prior experience with digital hardware manufacturing.

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*Suggested retail price.
 © Timex Computer Corporation, 1982

Fig. 2. A Timex Sinclair TS-1000 home computer ad in *Science Digest*, October 1982.

At the core of the home computer concept there was an assumption that a computer at home should serve the needs of all members of a family regardless of their knowledge of computer hardware or software; in fact, none was assumed essential for the home utilization of microcomputers.

As opposed to hobby computers, the home computer hardware was not supposed to be tampered with; all that a user had to do was to connect the power cord and peripherals via clearly marked ports and to locate the on/off switch. As for software, all major home computer manufacturers provided a variety of application programs and at least one programming language, mostly BASIC, in accord with an educational doctrine which expected an educated individual to be fluent in at least one programming language.

The BASIC programming language was easy to learn, easy to use, and could run on machines equipped with small amounts of memory.

Computer hobbyists rejected the home computing paradigm outright and considered “computers for the masses” a consumer electronics product doomed to failure, a solution looking for a problem.

However, the consumers’ reaction proved otherwise. By 1980, there were over 120,000 Apple IIs while Tandy sold over 175,000 of the TRS-80 microcomputers. The sales of tiny Sinclair ZX-80 and ZX-81 computers introduced in 1980 and 1981, respectively, reached 400,000 by 1982! In the same year, there were over 800,000 small Commodore VIC-20s world-wide. Sales reached the one million mark in early 1983 when Commodore was shipping its VIC-20s at the rate of 100,000 units a month.

In 1983, two other manufacturers joined the one million club: both Texas Instruments and Apple Computer shipped over one million of their TI-99/4A and Apple II computers. In 1984, there were over 2 million Apple IIs and, perhaps, even more Commodore 64s, arguably the world’s most successful small computers.

Home computer defined

In an effort to gain a large niche in the rapidly developing home computer market manufacturers examined and experimented with every aspect of microcomputer hardware and software from the home computer's architecture and software support to microcomputer's size and packaging.

With a few notable exceptions, home computers were built around 8-bit microprocessors, were equipped with small amounts of memory and had no operating system (no *Windows!*) One interacted with a home computer via application programs or a BASIC interpreter which was either permanently stored in the computer's memory or was available on an external storage media.

A typical solution to the packaging problem was to house all the hardware in the computer's keyboard enclosure. These enclosures were made of trendy plastics in a large spectrum of colors from white and beige to blue, silver, and black. A variety of connectors were mounted on the back and the sides of the case to connect a display and peripherals such as external storage devices, printers, and joysticks.



Fig. 4. The Commodore VIC-20 home computer. Source: unknown.

To make home computers affordable, most of them were designed to work with a TV set as a display and sound system.

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For more information, write: Atari, Inc., Dept. G2Q, PO. Box 16525, Denver, CO 80216. © 1982 Atari, Inc. All rights reserved. Don't miss *Discover: The World of Science*, brought to your home this September by Atari.

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Fig. 4. An Atari 400 home computer ad in *Science Digest*, December 1982.

The size of a typical home computer varied. While most of these computers would fit into a shoe box (as in the case of the Commodore VIC-20, Radio Shack TRS-80 Model 1, or Mattel Aquarius) other computers for home were two to four times larger (the Apple II or the Atari 800 can serve as examples). Some of the entry level home computers were no larger than a small paperback book. Sinclair's Z-80 micro measured only 6.5 by 8.5 by 1.5 inches. It was advertised as the world's first truly portable computer.

Since most home computers were built into their keyboard enclosures, they were frequently judged and compared with each other based on the type, size, layout, and quality of their keyboards.

Inexpensive home computers were equipped with small, difficult to use keyboards. Some of these entry-level micros used touch-sensitive membrane keyboards (as employed in some microwave ovens) or chiclet keyboards composed of small, flat rectangular or lozenge-shaped keys made of rubber or plastic (as in remote controls or inexpensive pocket calculators). More expensive computers for home, such as the Atari 800 or the Coleco Adam, were equipped with good quality, professional keyboards (the Adam's keyboard was also detachable).



Fig. 5. The Mattel Aquarius home computer used a chiclet keyboard. Source: oldcomputers.net/aquarius.html

Home computer software was offered on a variety of external storage media. There were inexpensive ROM cartridges holding application software permanently stored in the ROM chips inside these cartridges (the Excidy Sorcerer and the VideoBrain were among the earliest microcomputers to use ROM cartridge storage). ROM cartridges were inserted into an easily accessible cartridge connector.



Fig. 6. A Commodore C64 computer with ROM cartridges and tapes containing software. Source: unknown.

For the external storage of user-developed software and data, home computer manufacturers offered a variety of (mostly external) cassette and floppy disk drives. Cassette drives were inexpensive and, in most cases, could operate with ordinary audio cassettes. However, they were also slow, unreliable, and of low storage capacity. Furthermore, they were prone to software piracy as it was easy to copy a commercially produced program from one cassette to another.

Floppy disk drives were more expensive than cassette storage but offered more storage capacity, fast access times, and much higher reliability. While the 5.25-inch diskette was the standard, most home computer manufacturers offered their own diskette formats for data storage which, of course, made the very many home computer platforms highly incompatible.



Fig. 7. Commodore C64 software on floppy diskettes. Source: unknown.

Inexpensive computer modems for home computers, such as popular VIC-modem for the Commodore VIC-20, allowed a large number of people to get on-line and try the electronic mail or browse through the libraries of information available on local BBSs and commercial computer networks for the first time. A number of the on-line information services such as CompuServe, Delphi, Dow-Jones News Retrieval Service, MicroNET, or The Source owed their popularity and growth to the low-cost modems for home computers.

Home computers and digital entertainment

At the end of 1970s microcomputer manufacturers saw that people could be persuaded to buy a microcomputer, but finding ways to do so was a very challenging marketing task. Microcomputers in education, at schools and homes, seemed to be a part of the answer and had already been advocated by some computer education enthusiasts. But what else these early home computers were good for?



Fig. 8. What home computers are good for? Source: *Science Digest*, November 1983.

The use of microcomputers for home entertainment was a different story. Computer games were always popular with microcomputer users since the construction of the first hobby computers with toggle switches and lights. Furthermore, the video game industry had already created a vast and lucrative market for home electronic entertainment.

Portable video game systems had been sold in hundreds of thousands since the introduction of the first video game console—the Odyssey—by Magnavox in 1972. Video game consoles from Atari, APF Electronics, Bally Manufacturing, Coleco Industries, Fairchild Camera and Instrument, Magnavox, RCA, and other manufacturers, with games on plug-in ROM cartridges, were affordable, simple to operate, and vastly popular with children.

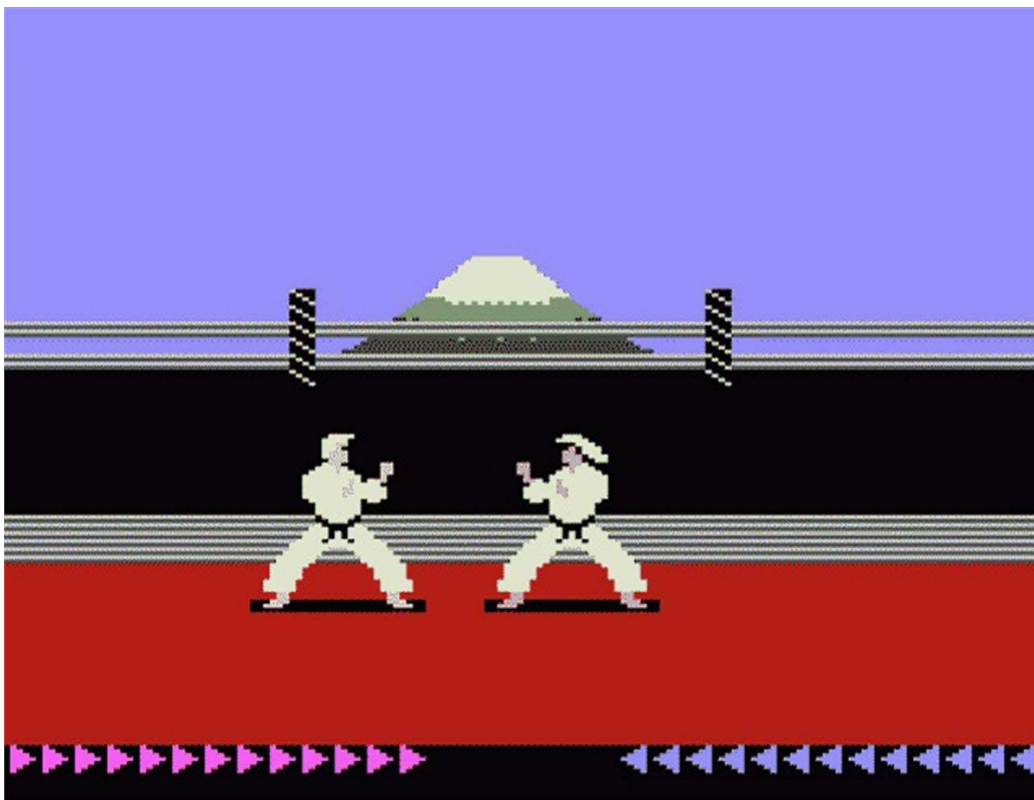


Fig. 9. A screenshot from *Karateka*, a 1984 computer game developed by Jordan Mechner and published in the U.S. by Brderbund. Source: unknown.

To make the home computer appealing to game players and to secure a sizable piece of the video game market, home computer manufacturers had to model their product, in part, after the video game console.

Atari, which made its name and established a leading role in the video and arcade game industry before entering the home computer market, advertised the game playing capabilities of its Atari home computers as being at par with video game consoles and arcades:

Bring the quality of coin-operated computer games into your home. You will find that the ATARI Home Computer version of PAC-MAN is virtually identical to its incredibly popular coin-operated counterpart... A wealth of excitement packed games awaits you at the keyboard of your ATARI Home Computer!



Fig. 10. The Atari 800 home computer. Source: York University Computer Museum.

This competition with game consoles explains why many home computers had much better graphics and sound capabilities than a typical business oriented desk-top microcomputer of that period.

This also explains why games occupied such a prominent position in the software libraries of Apple, Atari, Commodore, IBM, Radio Shack, Texas Instruments, and other manufacturers.

Microcomputers at war

According to Scott Cohen, author of *ZAP! The Rise and Fall of ATARI*, in 1981, one of the golden years of video game industry, “Video games raked in almost twice what Hollywood grossed; three times the combined TV revenues and gate receipts of major-league baseball, basketball and football; and four times the amount of money spent on records and rock concerts.” It seemed that everybody could make a lot of money in home computer and computer gaming industries.

However, by 1982, the home computer market was over saturated with all sorts of home computer hardware. The correction in the home computer market was inevitable.

The “computer war” started in the summer of 1982 and resulted in drastic reductions of computer prices. When it ended in late 1983, many companies were forced out of the microcomputer business all together.

What was even worse, there was no more space for home computers as the customers were already shifting their attention into more powerful desktop platforms represented by computers such as the IBM PC and, since 1984, the Apple Macintosh.

Those firms that survived the home computer war, most notably Commodore and Tandy, had to enter a new competitive territory of personal computers dominated by products from IBM and myriad of the IBM PC clones that mushroomed all over the world.

In the end, the home computer—an inexpensive, small but capable computer system for home and a rival to both the video game consoles and the desktop personal computers—proved to be an important but transitional period in the microcomputer’s history. By mid 1980s, the microcomputer market was dominated by desk-tops with 16-bit CPUs while gamers were ready to give another chance to the video game industry which developed a new generation of games and consoles.

The IBM PC and the Apple Mac Worlds

In the late 1970s and early 1980s, the home computer was not the only attempt at finding vast new markets for microcomputers. Obvious application areas, already targeted by the first-generation of personal microcomputers, were small business, office, and financial applications as well as research and education.

As personal microcomputing was coming of age and offering hardware that was, simultaneously, cheaper and more powerful, it was predicted that at least these market sectors would generate high demand for microcomputers.

As a result, a number of manufacturers introduced their advanced desk-top microcomputers. In comparison with home computers, the 'desk-tops' frequently employed more powerful microprocessors, sported more memory, were equipped with professional, good quality keyboards, dedicated displays (typically built-in, frequently high-resolution and color) and used diskette drives for external storage.

They were larger, heavier, and more expensive than home microcomputers. A desk-top computer's software suit typically included an operating system, at least one programming language, word processor, spreadsheet, database, and a variety of general business programs.

But it would not be until late 1981 when the business community at large would respond to the offering.

The IBM Personal Computer

In August of 1981, IBM entered the personal microcomputing scene with the announcement of its Personal Computer (the PC).



Fig. 11. The IBM Personal Computer. Source: York University Computer Museum.

IBM's decision to manufacture a desk-top personal microcomputer proved to be one of the most significant events in the microcomputer's short history. IBM did manufacture desk-top computers for personal use in the past. There were also other computer industry giants who were involved in the manufacturing of microcomputers long before the announcement of the IBM PC.

What was therefore surprising was not that IBM entered the personal microcomputer market but the overwhelmingly positive response from the business



Fig. 17. The IBM PC ad in January 1984 issue of *Science Digest*.

community and the speed with which the PC became an industry standard for a desk-top business computer. According to Robert X. Cringely, the author of *Accidental Empires*, IBM sold 50,000 PCs in the remaining four months of 1981 since its announcement. This figure jumped to 538,000 in 1983 and to 1,375,000 in 1984.

A number of software and hardware companies took an immediate advantage of the PC's popularity and IBM's disclosure of the machine's design. They began by providing software, plug-in expansion cards, and hardware add-ons for the PC. Then, they started to clone it. A cheaper IBM PC hardware and software compatible computers started to appear in late 1982.

Possibly the earliest IBM PC compatible computers were manufactured by Compaq Computer Corp. in the U.S. and Dynalogue Info-Tech. in Canada. The Compaq Portable was an inexpensive (and soon popular) alternative to the PC. On the other hand, the Dynalogue Hyperion was neither cheap nor 100 percent compatible. Interestingly, both of these computers were portable.



Fig. 12. Dynalogue Hyperion. Source: oldcomputers.net/hyperion.html

Compaq and Dynalistic were soon followed by a fast growing group of start-up and established companies offering their own PC-compatible computers.

In many cases, the only thing that visually distinguished an IBM PC clone from the genuine IBM product was the absence of the "IBM PC" logo on the computer's case. Even the documentation and its packaging prepared for the clones followed the same style and packaging as the original IBM PC documentation.



Fig. 13. The Lampar PC (left) a clone of the IBM PC (right).

By mid 1980s, the multi-billion personal computer market became dominated by IBM PC compatibles making both Intel—which supplied the PC market with microprocessors—and Microsoft—which provided the PCs with, among other software, the MS-DOS operating systems—very profitable.

By early 1990's, more than 80 percent of the personal computer market belonged to PC compatible computers while the rest, almost exclusively, to Apple Macintoshes.

The Macintosh Alternative

In 1981, Apple Computer sold 135,000 of its immensely popular Apple II computers and was leading the personal computer industry with 23 percent of the market share world wide. The Apple II's were affordable and appealed to a broad range of users.

By 1983, there would be even more of these micros—1,300,000—in homes, schools, and business offices. To ensure its long-term domination in the business desk-top niche of the microcomputing market, in 1979, Apple Computer initiated three desk-top microcomputer projects: the Apple III, the Lisa, and the Macintosh.



Fig. 13. The Apple Lisa was one of the earliest computers with graphical user interface.
Source: oldcomputers.net/lisa.html

The Apple III, released in 1980, proved to be a fiasco due to the design and manufacturing problems combined with overpricing. The Apple Lisa, introduced in January 1983, didn't do much better either.

In spite of many unique features (networking capabilities, and graphical user interface (GUI) with movable overlapping windows and pop-up menus user-manipulated with the help of a mouse) Lisa was slow, had some hardware problems and was very expensive (\$9,999 on introduction).

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The seven WordStar menus are your greatest aids. They are
like signposts at the top of your screen, showing you where
you are.
1HELP 2INDENT 3SET LM 4SET RM 5UNDLIN 6BLDFCE 7BEGBLK 8ENDBLK 9BEGFIL 10ENDFIL

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Fig. 14. Command-line interface was standard on early personal computers. Source: texteditors.org/cgi-bin/wiki.pl?WordStar

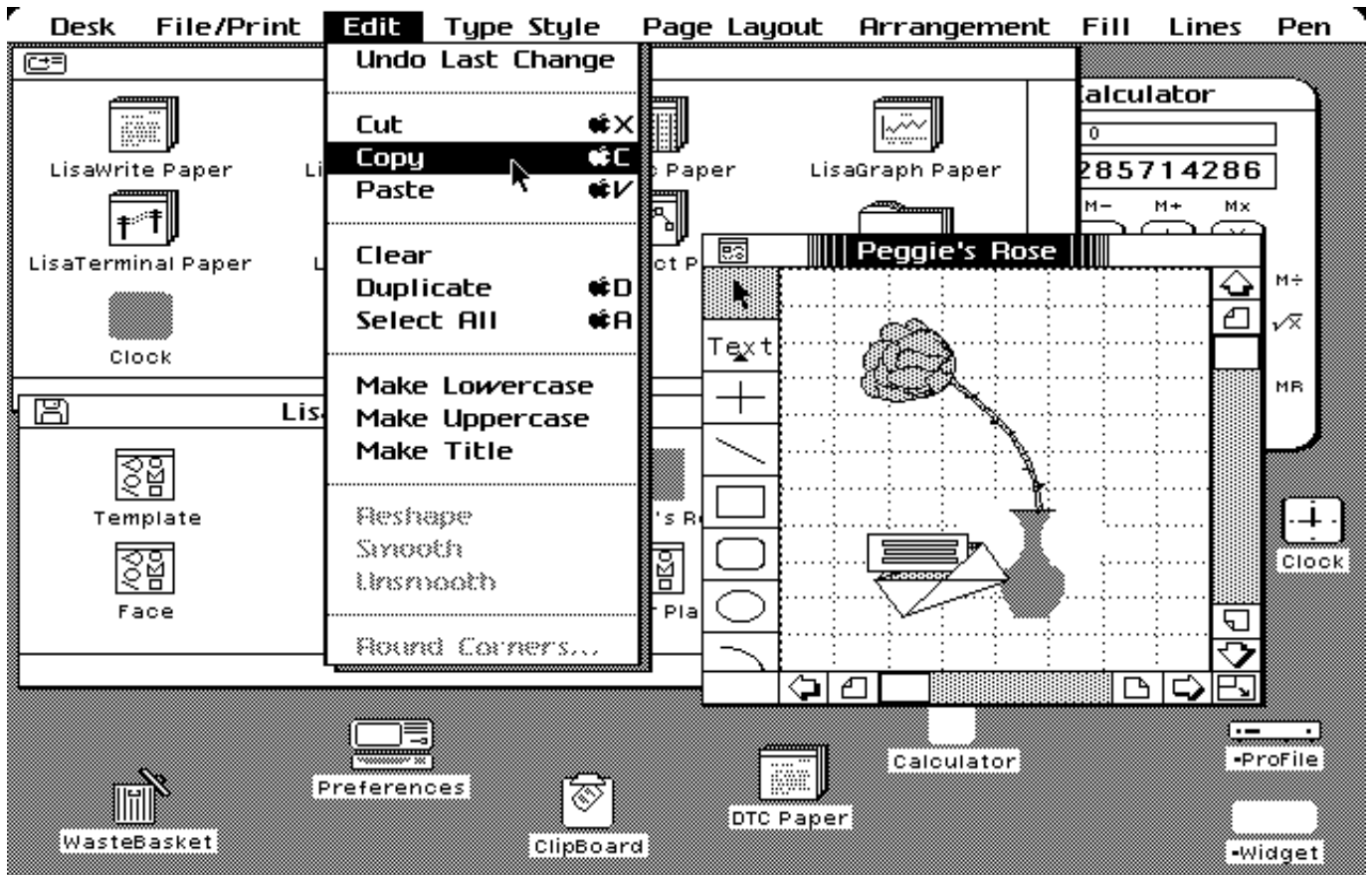


Fig. 15. Graphical user interface of Apple Lisa. Source: www.digibarn.com

Furthermore, it was the IBM PC, and not the superior Lisa, that was seizing control of the vastly lucrative segment of the market—sales to businesses—and was forcing many competitors to adapt or perish.

By 1983, Apple's market share dropped to 20 percent while its main competitor's—IBM's—claimed sharply to 26 percent from just 18 percent a year before. In the end, the Apple III's manufacturing was discontinued in 1984 and the Lisa's — a year later.

In January 1984, Apple introduced its Macintosh computer (the "Mac"). After a few good months following its introduction, the sales of the Macintosh stalled causing a corporate turmoil at Apple. The esthetically designed Macintosh offered GUI but had insufficient amount of memory, only one disk drive (built-in), no hard drive, no expansion slots and was overheating. Introduced with minimal software support, it was hardly a business computer system.



Fig. 16. The Apple Macintosh. Source: York University Computer Museum

In the early 1985, while IBM was introducing new PCs, there were indications that the Mac would share the fate of the Apple III and the Lisa and cause an irreversible damage to the company. In the end, the Macintosh did rescue Apple Computer. Upgraded, first to the 512k and the XL models and, later, to the Mac Plus, and supplied with the unique software, good quality laser printers, and networking capabilities, the Macintosh turned into a unique and effective tool for, among other areas, desk-top publishing and graphic-design. The Mac sales would continue to grow each year through the 1980s crossing the one million unit sales a year point in 1989 and would pick in 1995. But that would still amount to only a small fraction of the personal computer world which, by that time, was dominated by the Intel Pentium-based machines running under Microsoft DOS and Windows operating systems. One could just walk into any computer store and order a Pentium-based PC to be put together to match the clients' needs and budget. The Macs were only available from exclusive retail locations.

Microcomputers drop ‘Micro’

In less than thirty years from its creation, the microcomputing had undergone a radical transformation. From its humble beginning, when it tried to define its purpose and to open-up new markets in terms of slow machines, it became a major force in redefining the society and its culture, backed by powerful microcomputers manufactured in millions each year.

In this short period of microcomputer’s history, the majority of operating computers became microprocessor-based making the prefix ‘micro’ in the term ‘microcomputer’ redundant.

There would be still *personal computers*—the PCs and Macs—and the *desktops*. But other microcomputer categories and classifications created in the first half of 1980s: *home, business, office, luggable, transportable, and portable* microcomputers disappeared in the 1990s making space for new classifications of emerging computer products such as *laptops, notebooks, or tablets*, and myriad of pocket-sized computing devices such as *Personal Digital Assistants (PDAs)* that will morph into tablets and smartphones at the beginning of the 21st century.

Small *Pocket computers* first appeared in 1980 and were programmable in BASIC. They were sold by Casio, Epson, Hewlett-Packard, Panasonic, Sharp, and Tandy. Twenty years later, pocket computers would reemerge as capable *pocket PCs*; they too, will be transformed into smartphones and tablets.



Fig. 17. The Radio Shack Pocket Computer 1 ad in a 1983 catalogue.

The era of the microprocessor and the microcomputer has not ended. Regardless of what the new computer and information technologies offer us in the future the microprocessor-powered computers will certainly be the major factor in the creation of the technological and social infrastructure to take us to the next step.

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