MCM on Personal Software

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Micro Computer Machines was among the earliest companies to embark on the personal microcomputer project. The evolution of the company's views on personal software was emblematic of the personal computing paradigm's transformations, which occurred with some regularity and in several regions of the world throughout the history of personal computing.

The standard narrative of software history situates the effective beginning of the PC software industry in the period of 1975–1979, originating with the announcement of the MITS Altair 8800 hobby computer in January 1975 and the release of the Microsoft Basic interpreter for the computer later that year. The introduction of the CP/M operating system by Digital Research in 1976, the arrival of home computers on the consumer electronics market in 1977, and the publication of the VisiCalc spreadsheet program by Software Arts in 1979 are further highlighted as pivotal moments in laying the foundations of the industry. Such narratives are derived from the corporate histories of the first movers in PC software and emphasize the socioeconomic ramifications of their pioneering activities, frequently keeping the complex connections with early software development practices and culture hidden, limiting our understanding of the shaping of personal computing in the early days: of making programming one's own computer a dominant form of the interaction with the microcomputer, of propelling Basic to a de facto standard for programming hobby and home computers, and of having computer games rise to dominance in the PC software class. Perhaps that is why some historians, most notably Michael Mahoney, have urged us to probe deeper into computer software's past in order to "reveal the roots of that [PC] software in the earlier period." Indeed, such roots reach deep into the established software development practices and activities of software-sharing communities formed around early computer user groups and associations. Personal software—that is, computer software written for personal use—was created and shared long before the arrival of the first microprocessor-based computers. Basic gained widespread acceptance within the computer hobby movement not only because its interpreters could be written for computers with small amounts of memory. Indeed, years before one such interpreter was offered by Microsoft to Altair 8800 users, the language had already been popularized by manufacturers of time-sharing systems, minicomputers, and programmable calculators, and established as "people's language" by computer enthusiasts. Computer games instantly overtook the budding PC software scene because there was not much else that could be written for rudimentary 8-bit machines, but also because computer entertainment was already a well-established personal software genre. In some instances, games were distributed in the human-readable form in hundreds of thousands of copies years before similar sales levels were reached by the first commercial PC "killer apps," such as VisiCalc.

In response to Mahoney's call for probing into the preindustrial period in the history of PC software, one can start by looking into software policies adopted by the earliest personal computer makers. These companies were the first to wrestle with the issues of defining personal computing, of determining the degree to which software was to be a part of such a concept in relation to hardware architecture, ownership, and accessibility, and of determining how much established software development and distribution practice could be integrated into the personal computing paradigm. In this article I do just that by focusing on one such company—Micro Computer Machines (MCM). MCM was the first company to embark on the personal microcomputer project. In 1972, it began
designing its MCM/70 personal microcomputer, which the company offered in subsequent years with systems and some applications software. The study of MCM's early software policies reveals much about personal software's migration patterns from the established computer and programmable calculator industries to microcomputing. It reveals how strong these software ties were, and why, in the end, they had to be relaxed. MCM's case study also identifies stages of PC users' conceptualization, starting from the fusion of the owner, end-user, and personal software developer roles, and ending with the owner-as-software-consumer paradigm. Even though MCM was not a major force on the personal computing scene, the evolution of the company's views on applications software were emblematic of the paradigm's transformations, which occurred in several regions of the world throughout the early history of personal computing.

MCM's corporate history and the annals of the MCM/70 computer, including its limited acceptance in the marketplace, are discussed in detail in my book *Inventing the PC: The MCM/70 Story* and only briefly in the following section. Unfortunately, my book does not articulate the issue of personal software to any satisfactory degree—the omission that I aim to rectify in this work. To this end, in this article I look at the five-year period of MCM's software activities that began in 1972, when the company was financially sound and was freely exploring hardware and software solutions for its personal computer. Analysis of MCM's software policies is less transparent when applied to the post-1974 era, when software decisions were made at a time of corporate unrest at MCM and under worsening financial constraints. To the extent possible, I stress the distinction between those software policies that were viewed by MCM as central and those which could only be achieved under a tight financial regime.

**The MCM/70 Microcomputer**

MCM was incorporated in Toronto, Ontario, on 28 December 1971 as Kutt Systems Inc. (the company was renamed as Micro Computer Machines Ltd. in the following year). Initially, the company was planning to build $1,000 calculator programmable with a minimal subset of APL programming language. Since their introduction in the mid-1960s, programmable calculators had been gaining popularity as cost-effective problem-solving tools and an alternative to minicomputers in applications that did not require the full computational capabilities of the minis. Olivetti introduced its first desktop programmable calculator—the Programma 101 (or P-101)—in 1965 and was soon followed by Busicom, CompuCorp, Hewlett-Packard, Monroe, Wang, and other manufacturers that offered similar products. Business, education, research, engineering, and government administration were singled out as areas that could benefit most from such calculating aids.

Until 1972, such calculators were key-stroke programmable and, because of their small amounts of memory, only short programs could be keyed in or read from various storage media, such as punched cards (Busicom 2017), magnetic cards (Olivetti P-101, Hewlett-Packard 9810A), cassette tapes (Wang 700), and ROM cartridges (HP 9810A). MCM saw its chance in the limited programmability of these devices and planned to offer a new type of device programmable in a calculator-oriented subset of APL, for a fraction of the price of programmable calculators available on the market. In the early 1970s, APL was attracting much attention from both the industry and academia. However, the language's superiority to programming aids offered by the early programmable calculators alone would not suffice to successfully compete with the calculator manufacturers well entrenched in a fiercely competitive market. Furthermore, despite significant cost savings expected from the planned use of Intel's first microprocessors, getting the price of the MCM's APL calculator down to the target level of $1,000 was not feasible. For those reasons, by June 1972 MCM abandoned the project in favor of an APL programmable desktop microcomputer and defined a market niche for the new product. The MCM/70 was to be an inexpensive, general-purpose computer that would "bridge the gap between the sophisticated [programmable] calculators that offer simplicity of operation but fail to provide the information processing capability of the computer ... and the large, complex computers that require such high degrees of training and experience as to place them beyond the operational capabilities of most people who want to use them." The MCM/70 was to appeal to both computer experts and novices alike. Although MCM's product philosophy (of bridging the calculating and computing worlds) seemed to be phrased in
the promotional jargon developed by the manufacturers of programmable calculators, MCM introduced a new personal perspective to the desktop information processing narrative and correctly assessed the potential of budding microprocessor technology as the computing paradigm shifter.\textsuperscript{10}

Inexpensive, easy-to-operate computers, such as the MCM/70, and not programmable calculators, were to make widespread, personal information processing a reality. In 1973, Mers Kutt, the inventor of the MCM/70 and the company’s first president, painted computing’s future landscape as one filled with millions of small computers, just like the MCM/70, and only a limited number of large ones.\textsuperscript{11} MCM did not coin the term “personal computer,” and the company used it only sporadically in its promotional literature.\textsuperscript{12} Instead, MCM referred to its computers as devices that would “make personal computer use and ownership a reality.” Documents spoke of personal computer use, personal problem solving, personal libraries of programs and data. They mentioned computers that could be brought easily into the home. What was left of the abandoned APL calculator idea became the key characteristics of the MCM personal computer: ease of operation, affordability, personal use, and ownership, as encapsulated in this sentence from the 1975 promo: “The first complete stand-alone micro computer to provide full scale information processing capability—with the power of a large-scale computer and the ease of a programmable calculator. Right at your own desk... or anywhere else it may be needed. At a price you can afford.”\textsuperscript{13}

The MCM/70 was demonstrated for the first time in May 1973 during the APL Conference in Toronto and was shown around Europe and North America during the rest of that year (see Figure 1). It used the Intel 8008 microprocessor as the CPU and featured both resident and virtual memory. The computer was equipped with built-in plasma display, APL keyboard, and up to two cassette drives. The cassettes were used for storage and retrieval of data and applications software, as well as to implement virtual memory, which provided the user with up to 200 Kbytes of memory. The computer’s ROM contained an operating system and an APL interpreter. In 1974 and 1975, an MCM/70 could be purchased for between $4,700 and $9,800 depending on the hardware configuration. The base machine without external storage and minimal memory (of just 2K of user workspace) was sold in North America and Europe as an “advanced programmable calculator.”\textsuperscript{14}

**MCM/70 Systems Software**

In the period between the announcement of the MCM/70 and its commercial introduction in the second half of 1974, MCM was focused almost exclusively on hardware and systems software. The company maintained that society’s direct and unrestricted access to computers could be accomplished with affordable personal computing devices bundled with user-friendly OS and powerful but simple programming languages. A user-oriented operating environment was the only software aspect of the personal computing paradigm considered by the company at that time. Without such an environment, the MCM/70 desktop would not be “as easy to use as a calculator.”\textsuperscript{15}

The MCM/70’s OS comprised two modules, called EASY and AVS, that managed the computer’s virtual memory, cassette drives, and power supply. It also provided general I/O utilities. The user interacted with the computer’s OS through a set of simple commands implemented in APL-like syntax. EASY (or External Allocation System) provided traditional I/O functions for digital cassette-based storage and retrieval of user-defined APL functions and variables (the so-called objects), which were arranged in groups. Such groups could be activated or deactivated, selected, listed, and modified (created, appended, deleted). EASY also controlled the mounting and unmounting of cassette tapes, and the “graceful” powering down of the computer with an OS command.

A Virtual System (AVS) managed virtual memory of the computer. Because the MCM/70’s APL interpreter—the MCM/APL—required much more memory than the Intel 8008 CPU could address directly, the MCM/70

![Figure 1. An MCM/70 prototype, ca. 1973.](Courtesy of the York University Computer Museum)
swapped programs and data between RAM and digital cassettes mounted in the tape drives of the computer. The MCM/70’s AVS-controlled virtual memory, developed by André Arpin between 1973 and 1974, was a unique piece of computer engineering. In the early 1970s, this type of memory was available only on some mainframes, and there were no blueprints for its implementation on a small computer.\textsuperscript{16}

The choice of a programming language was as important to the MCM/70 personal computer concept as the machine’s OS. Fluency in at least one programming language, claimed MCM, was an essential prerequisite to the personal use of computers. The computer is a problem-solving tool, explained the author of the preliminary MCM/70 user’s manual to an MCM/70 owner, and in order to use it in such a manner, one has to “talk” to it. “[T]elling the computer how to solve the problem is called programming. Because computers are machines, they must be programmed using special computer languages.”\textsuperscript{17} For MCM, that special language was APL. At the time of the MCM/70’s design, APL was offered by several major computer manufacturers, including Burroughs, Control Data Corporation, Digital Equipment, IBM, Siemens, and Xerox, as well as by several time-sharing systems, such as IP SHARP (IPSA), Scientific Time-Sharing Corporation (STSC), and Proprietary Computer Systems/The Computer Company (PCS/TCC APL Timesharing System). The language was considered powerful, concise, and easy to learn and use.

The MCM/APL was designed by Gordon Ramer between 1972 and 1974. To a large extent, it was compatible with the IBM APL\textsuperscript{360} and its shared-variable extension APLSV. It was presented by MCM as a personal language–a direct end-user programming tool. The MCM/APL was “designed to be simple and easy to learn so that the non-programmer professional can quickly learn to express his own problems in his own way.”\textsuperscript{18}

How quickly? MCM claimed that a user could begin computing in APL after only a few hours of exposure to it, and eventually would find that “APL gives an almost astonishing capability to solve complex problems, right from accounting, finance, inventory, forecasting to engineering, with the shortest programs of any existing computer language.”\textsuperscript{19}

The MCM/APL’s claimed features were not just a marketing stratagem to counter similar performance claims asserted by manufacturers of programmable calculators: claims that their languages were easy to learn and simple to use, thus making their calculators the best solution machines for calculation problems in diverse application fields, including those identified by MCM for its computer.\textsuperscript{20} APL’s concise syntax fit well the requirements of a computer with one-line display and limited directly addressable memory. The rich set of MCM/APL’s arithmetic operations allowed instant use of the computer as a calculator before advancing to more complex tasks.\textsuperscript{21}

**Be Your Own Programmer**

MCM’s policy on systems software had not changed much through the company’s more-than-a-decade-long corporate existence. However, the company’s position on personal software had undergone several evolutionary changes. Initially, MCM derived its personal software policy from established software development practices. In 1973, at the time of the MCM/70’s announcement and its extensive international promotion, hardware manufacturers dealt mainly in systems software, leaving the domain of applications software to end users. MCM, too, chose to follow these practices. It was “not at all out of line to expect people to take the MCM computer and write their application for it,” explained former MCM programmer Cam Farnell. “[T]his was before the days of ‘off the shelf’ software when virtually all software was custom written: no buying programs from the non-existent computer store and no downloading open-source software from the non-existent Internet!”\textsuperscript{22} Initially, MCM distanced itself from applications software development and integrated the applications software issues with its personal computing paradigm rooted in systems software. MCM maintained that a desktop operated in a powerful but user-friendly operating environment would bridge the gap between the roles of the computer owner, end user, operator, and applications software developer–it would fuse all of these roles into a new owner-as-programmer paradigm. With MCM computers, advertised the company, you could “solve your own problems,” “be your own programmer”–in short, express and solve problems yourself in a unique, individual way.\textsuperscript{23} The user was encouraged to develop personal information-processing libraries of software and data. By doing so, argued MCM, “You will have a full-scale personal store of processed information that you can keep secure right in your own desk.
drawer.” Self-developed software libraries, continued MCM, “can be made as personally useful and flexible as notebooks, workfiles and other business tools.” Furthermore, “Additional savings are brought about because of the ease with which MCM/700’s APL language allows you to be your own programmer.”

The company expected that most users would initially use a small subset of APL but quickly develop their own APL functions and start combining them into interactive applications. There were many sources of APL code that an APL novice could tap into: books, technical APL publications, and thematic packages of APL functions freely distributed by APL enthusiasts.

The ramifications of MCM’s owner-as-programmer paradigm for distributors of MCM products were serious. MCM was selling its computers through a chain of distributors. Therefore, it was the distributors and not MCM who were to bring the “be your own programmer” message to prospective clients, to convince them that they, too, could become effective APL programmers. For its part, MCM prepared some programming aids and applications packages, and offered APL training to distributors at no charge. Unfortunately, because of financial constraints, there was not much more that the company could do. Perhaps MCM expected that once the market fully recognized the benefits of the MCM portable computer concept, programming one’s own computer would become as widely accepted as operating one’s own calculator.

**Early MCM Applications Software**

Early MCM/70 promotional literature did not mention applications software at all. Instead, the documents listed application areas where the MCM/70 would be most suitable, and attempted to demonstrate the simplicity and power of its MCM/APL by comparing sorting codes written in Fortran and Basic (long) with those written in MCM/APL (one short line of a few characters). Although the company’s view of end users as personal software developers would persist until 1976, the competition in the marketplace as well as customer support needs made the company acknowledge that the end users and distributors, representing various levels of programming skills, should not be left entirely to their own resourcefulness, and that MCM had to develop, maintain, and coordinate applications support.

MCM may have learned its first applications software lesson during the 1973 SICOB exhibit in Paris, when Digital Equipment Corporation showcased its PDP 11/45 mini using several well-received demonstrations, including image digitization. By contrast, MCM could merely offer the visitors some calculator features of the MCM/APL and a rudimentary horse racing game that featured five horses, displayed as numbers 1 to 5, racing from the left end of the screen to the right. Good demos were invaluable marketing tools, and relying exclusively on distributors to develop them could significantly affect the sales. And so, during the official launch of the MCM/70 in Toronto on 25 September, just days after the SICOB event, MCM indicated that it intended to support its computers with applications software. “Cassettes will later be developed and marketed for specific applications, including text editing, general ledger, and taxation.” This announcement was the first indication that the user-as-programmer paradigm would be relaxed. The first step in this direction was the development of applications libraries—sets of useful APL functions that users could incorporate into their applications and which MCM distributors could use for demonstrations as well as for the development of their own applications packages to meet customers’ specific needs. According to Ramer, some MCM distributors, such as SYSMO in France, developed several such packages for their customers. In the documents distributed by MCM to its shareholders in 1974, the company stressed its commitment to the development of applications libraries. However, because of financial constraints the company only came up with a collection of quick-and-dirty libraries composed mostly of APL shareware. The collection, named the MCM/70 Application Libraries (or LIB/70), was released in mid-1974 and consisted of more than 150 APL functions for use in application areas, such as finance, statistics, mathematics, engineering, computer-aided instructions, and games (see Figure 2). For instance, the Statistics Library in the LIB/70 collection contained 39 functions, 15 of which were authored by Keith Smillie of the University of Alberta and taken from his APL statistical packages, known as STATPACKs. The remaining functions in the library were developed by anonymous programmers. Smillie considered his STATPACKs free contributions to the APL community. MCM, on the other hand, charged $300 for its Statistics...
Library (in 1975) and, according to Smillie, did not pay him any royalties. Thematic bundling of APL functions and their free distribution reflected a widespread practice within the APL community. Such was the case with Smillie’s STATPACKs. Such was also the case with packages collected and offered to the APL community by Edward Edwards of the University of Alberta. In 1970, three years before joining MCM, Edwards released several APL packages, including arithmetic, text editing, electrical engineering, matrix algebra in real and complex domains, and polynomial and real approximation. His complex arithmetic package COMPLEX, created in 1970, became the Electrical Engineering library of LIB/70.30

Despite their unquestionable utility to MCM users, there were no champions of the applications libraries at MCM, and their development was rather stagnant. According to Ramer, “if a potential buyer asked for something, it got added to the library.” Farrell’s comments reflected the general attitude at the company. “I viewed them a bit as I would training wheels on a bicycle: something that a ‘real’ programmer would soon not need.” He also observed rather peculiar anti-applications software sentiments on the part of systems programmers, although he, himself a systems programmer, wrote what would become MCM’s first word processor: “The impression I had was that the system programmers [at MCM] ... viewed application programs rather as the chef of a fine restaurant would view McDonald’s: although popular with the masses, something distinctly inferior and to be avoided if possible.” In 1976, LIB/70 was augmented with a new collection of APL functions–LIB/8—but these were mostly APL functions that facilitated the creation of a library of user application packages and accessing some of the packages distributed by the company. The LIB/70 remained unchanged until 1979, when the sales of the MCM/70 and MCM/700 were discontinued.

MCM applications libraries were sold as packaged software. A packaged library included a magnetic cassette tape and a manual containing functions’ documentation, APL code listings, and sample applications. In February 1975, these libraries were priced at between $100 (games package) to $300 (statistics package).31 The inclusion of function codes in the library’s documentation proved fruitful because some of the users improved the codes of several functions and submitted the revised programs back to MCM.

The competition with APL time-sharing services and manufacturers of programmable calculators was another reason for the development of MCM applications libraries. One of the claimed advantages of MCM computers over APL time-sharing systems was cost-effectiveness in applications that did not require the computing power of mainframes. MCM computers were promoted as “stand-alone computer systems providing all the capabilities of a large shared computer system with none of the inconveniences and at a fraction of the expense.”32 Of course, MCM was well aware that APL time-sharing systems offered more than just an access to advanced hardware to its clients for a hefty price. They also offered vast public APL applications libraries. In 1972, The PCS/TCC APL Time-sharing System claimed to offer the world’s largest APL applications library of more than 2,000 programs covering both business and scientific applications.33

Public APL libraries offered by IP SHARP and STSC services were also extensive, as were the libraries offered by manufacturers of programming calculators. In 1971, Wang claimed that its Series 700 programmable calculator had more available software than the rest of the calculator industry. Olivetti was not far behind, offering its customers the choice: “Program the P-602 yourself, or use the basic and application software developed by us.”34 If MCM wanted to successfully compete with time-sharing systems and the calculator industry, it too had to offer similar resources to support customers’ computational needs.

A major shift in MCM’s applications software policy came at the end of 1975, when MCM offered its first commercial-grade application—the TEXT/700 word processor—which,
MCM claimed, provided a full word-processing capability to users of MCM microcomputers.\textsuperscript{35} Evidently, MCM could not possibly expect that users who were in need of a word processor would write one anew or adapt, say, the APL PLUS Text Editor offered by STCS from 1973.\textsuperscript{36} MCM's own word-processing needs justified the introduction of such a product, especially after one of the company's employees, Cam Farnell, happened to develop such a program in his spare time between 1973 and 1974. According to Farnell, the TEXT/700 software did not originate as an MCM project. “It was something I wrote in my spare time and on weekends pretty much as a lark because I was young and keen ... I don't believe I had ever seen a word processor prior to writing TEXT/700. I was just attempting to come up with something that could handle legal documents. No other program served as a blueprint ... It was pretty clunky, but then it had to run on a slow machine whose only mass storage was two cassette tape drives and whose display was one line of 32 characters.” For reasons of performance, the program was written in the Intel 8008 assembler. Once the software was loaded into RAM, the computer became a word processor. The user was presented with the main menu, from which one could select the option “N” to create a new document, “E” to edit an existing document, “P” to print an existing document, or “X” to turn the machine off. And all of that in just 7K of code. Other features of the TEXT/700 included variable character and line spacing, automatic right and left column justification, automatic page centering and numbering, optional text selection, and customization (see Figure 3).

Farnell’s processor became MCM’s TEXT/700 when the MCM/70 was upgraded to the MCM/700 model. The TEXT/800 word processor released for the MCM/800 computer was a much more advanced product designed to work with a CRT monitor (MCM’s VUDU display). It also featured some limited electronic spreadsheet functions.\textsuperscript{37} Despite publishing some applications software, the company saw itself more as a software clearinghouse for contributed applications software than a publisher. In early 1976, to facilitate the interchange of user-developed software, MCM formed the MCM/APL Users Group.\textsuperscript{38}

**End Users as Software Consumers**

By 1976, MCM had a better grasp of the end users’ needs. The idea of MCM computers facilitating a software engineering experience, which had prevailed at the company’s start-up, turned out to be far from universally appealing. There were those who, given a choice, would prefer to acquire professional-grade software instead of tools for their in-house development; there were users who wanted to know how to best interact with applications software but not necessarily to understand the software’s inner workings on the APL code level. In the end, the company had to relax its personal computing paradigm to make space for software consumers.

Early evidence of the target end-user shift can be found when comparing two MCM promotional brochures: MCM/700: Introducing the First, Smallest, Least Expensive, Stand-Alone APL Desktop Computer, published in 1975, and MCM Computers: System 800, distributed a year later. Both documents promote portable, easy-to-use APL computers, namely the MCM/700 and MCM/800. Although the latter document is, in large part, a verbatim copy of the former, it lacks all of the explicit references to MCM users as programmers that had been present in the MCM/700 brochure. For instance, the “Be your own programmer” section in the 1975 brochure contains a claim concerning the simplicity of MCM/APL: “Within less than an hour of following simple step-by-step instructions, you can start programming with APL.” However, in the 1976 promo, this section is renamed more subtly as “Solve your own problems,” and the term “programming” in the above-quoted claim is replaced with “problem solving.” The term “programming” is used only in the context of computer-oriented personnel. Similarly, the “Develop your own information processing library” section in the MCM/700 brochure is renamed as “Utilize Applications Libraries to meet your needs.” Although the MCM/800 brochure still stresses overall savings by using APL in program development, the revised section does not necessarily imply that the end user was to be directly involved in programming, and hence the trinity of owner, end user, and personal software developer advocated for the MCM/70 and MCM/700 computers was overturned.

MCM acknowledged that there is no one category of MCM user but a wide variety, including nonprogrammers, and stressed its software development transparency. In a 1976 promotional letter addressed to MCM clients, John Koiste, MCM’s general manager, reassured software consumers that they did...
not have to do any programming at all if they wanted just to use MCM accounting, financial, or inventory software packages. But the letter also addressed those potential users who would want to understand the theory behind an application software or even review the APL code itself. For the benefit of those users, both the applications software's background theory and the APL code were to be made available. Koiste supported this transparency policy by describing the software development process adopted at MCM, using the company's accounting and financial software as an example. A study of background theory was done first, usually based on standard academic texts, to make sure that the methods implemented in the product were sound. Then, APL texts were searched for code that could be adapted. In the following years, MCM would observe its new applications software policies to various degrees. The company promoted its PVAS pension valuation and employee administrative system, emphasizing that it was developed for use by nonprogrammers and jointly with an actuarial and administrative services firm (Spencer Organization Inc.) (see Figure 4). Similarly, the MCM Client Accounting System software was designed to be used by any accounting clerk with no previous computer experience. Its specifications and configuration, stressed MCM, were designed by a chartered accounting firm.

MCM's choice to expand the range of end users rather than to abandon the concept of programming one's own computer and to shift its focus onto software consumers exclusively was deeply rooted in MCM's strong and persistent commitment to APL. In the mid-1970s, there was no microcomputer software industry, and the company was in no financial position to support the applications software needs of its diverse clientele to any satisfactory degree. The launch of the PC software industry in the late 1970s had not improved the situation either. The industry never extended into APL territory in any significant way, which meant that the in-house development and adaptation of APL programs had to remain the main source of APL personal software. In 1980, MCM started to publish its "MCM User Support Notes" to stimulate the development of MCM/APL applications. The notes covered, among other topics, programming and application package design hints, program and data security, and differences between APL dialects. However, the lack of extensive commercial-grade applications libraries for MCM computers would haunt the company until its very closure in 1982.

**Personal Software Evolution: The Roots and the Pattern**

MCM's initial position on personal software was deeply rooted in the established software development practices and culture. End users were to take care of their applications software needs; user-developed libraries were to convey the personal aspect of software and reflect individual needs and problem-solving styles. This initial viewpoint and its subsequent evolution through the 1970s at MCM was emblematic of the personal computing paradigm's formation and reshaping to take place in other communities and in several regions of the world. The worldwide microcomputer hobby movement and home computing can
serve as examples. All of these activities began at a time when the microcomputer software industry either did not exist or was in its infancy, and for these reasons these activities had to support the owner-as-programmer paradigm. Eventually, they spawned a lucrative personal software industry, which by the early 1980s was creating software worth hundreds of millions of dollars in the United States alone.41

The first phase of the North American computer hobby movement was characterized by building and experimenting with rudimentary microprocessor-based hardware. Early 8-bit microcomputers, such as the Scelbi 8H (Scelbi Computer Consulting, 1974), the Altair 8800 (MITS, 1975), and the KIM-1 (MOS Technology, 1975) were offered with rudimentary systems software only, if at all. A computer enthusiast was expected to write or acquire software as part of the hobby computing experience. Nathan Wardsworth saw programming the Scelbi 8H computer that he designed in 1974 in the same way that MCM viewed the use of its MCM/70—as an integral part of personal computing. He referred to programming as an exciting and rewarding pastime, an expression of individual creativity.42

Tapping into the existing personal software resources became possible with the offering of the first Basic interpreters for the hobby machines. Several Basic games popularized by the Digital Equipment Computer Users’ Society (DECUS) and subsequently published by Ahl in his 101 BASIC Computer Games became instant “hits” with microcomputer users around the globe.43 Sharing software was mostly accomplished through participation in computer user clubs and printed media. Basic not only made programming hobby computers easier but also reinforced the user-as-programmer paradigm that had begun to form in computer enthusiast circles in the early 1970s. There was not much difference in the computer use rhetoric expressed by MCM and that displayed in, for instance, The People’s Computer Company magazine, which advocated the use of Basic as the “personal” programming language of choice. Proponents of both APL and Basic referred to their languages as “people’s” or “personal”—simple to learn but powerful.

Computer hobbyists outside the North American continent also relied on programming their own computers before becoming the consumers of software. In Japan, hobby computing had begun in the second half of the 1970s with the appearance of the first microcomputer kits, such as the NEC TK-80 single-board trainer, introduced in August 1976. As was the case with some North American microcomputer trainers, such as the KIM-1, the TK-80 chiefly attracted the attention of electronics enthusiasts, who accounted for

Figure 4. The cover of a 1976 brochure promoting MCM's PVAS software. (Courtesy of the York University Computer Museum)
most of its sales (approximately 66,000 units were sold during the first two years).\textsuperscript{44} The TK-80 was offered with an assembly language manual and a simple monitor program only. Basic interpreters were made available with the introduction of the TK-80’s expanded BS model in 1977. The absence of the microcomputer software industry sustained hobbyists’ enthusiasm for programming through the 1970s, an enthusiasm that manufacturers, such as NEC, further exploited and reinforced in the marketing of their microcomputers.\textsuperscript{45}

The worldwide home computing industry provides another example. Created in the late 1970s when the microcomputer software industry was still in its infancy, the industry borrowed heavily from the hobby computing and computer literacy narratives. Programming a home computer was the way to communicate with one’s first micro. It was not only easy but also a promise of—a rewarding, exciting, and fun activity.\textsuperscript{46}

In Japan, the programming-oriented use of home computers continued through the 1970s. NEC’s Compo 80/BS personal computer—the all-in-one refinement of the TK-80—and the PC-8001, which were released in 1978 and 1979, respectively, were offered with Basic interpreters. And so were home computers offered by other manufacturers and released during the Japanese microcomputing boom of the 1970s, micros such as the M200 Smart Home Computer (Sord, 1977) and the bestselling MZ-80K Personal Computer (Sharp, 1978).\textsuperscript{47} The users were left to their own programming resourcefulness or to accessing rudimentary software published in computer magazines and books (including Ahl’s \textit{101 BASIC Computer Games}, which was published in Japan by ASCII in 1979).

By the end of the 1970s, the hobbyists’ and the home computing industry’s outlook on personal software started to shift toward software consumption, although, in the hobbyists’ case, the process was less transparent because of the decline of the movement in North America and Japan under the growing popularity of home and personal computers. Several hobbyists became successful personal software producers. Others started to look into commercial off-the-shelf micros with a manufacturer’s warranty and ever-expanding software libraries rather than into new microcomputer construction projects.\textsuperscript{48}

MCM expanded its user base to include software consumers, mostly under pressure from its competitors. The home computing industry, too, could not sustain its growth much longer without the inclusion of those who would mostly use a computer as a software player—in the same way as one used a videogame console with software on ready and easy-to-use storage media. Although most microcomputer manufacturers still encouraged programming as a viable form of interacting with a computer, fierce competition in the home computer market and with the lucrative videogame industry necessitated publication of extensive libraries of ready-to-use personal software and, as a result, turned the budding microcomputer software business into a viable industry.\textsuperscript{49}

In the early 1970s, there were other microcomputer manufacturers besides MCM that faced the applications software issue in the early stages of personal computing—firms such as Scelbi Computer Consulting in the United States and NEC in Japan. Their choices and actions were constrained by, among other factors, the limits and possibilities of the state of the art at the time and guided by a vision of computing’s future, which, as Kutt professed in 1973, would be filled with millions of small computers, just like the MCM/70, and only a limited number of large ones. Clearly, then, their accounts should be captured and incorporated into the history of software narratives, for they contain important clues about the formation of the personal computing paradigm and the role of personal software in that process. It is also clear that such clues could be found elsewhere, and that brings me back to one of the subjects that has been briefly discussed in the section on early MCM applications software but which deserves a much more comprehensive and dedicated study. This subject is the programmable calculator and the minicomputer industries of the late 1960s and early 1970s and their role in setting up a stage for the first steps toward personal use of computers. The minicomputer industry set the performance targets for the early microcomputer firms; it established software development practices and policies, and modes of dissemination of technological culture (including diverse forms of interaction with users through user clubs, newsletters, and meetings). On the other hand, the programmable calculator industry successfully expanded the user base, and with it the demand for computing devices less able than minicomputers. It offered cheaper, easier-to-operate programmable hardware (or “microcomputers” in the marketing
language of Olivetti) supported with vast libraries of ready-to-use applications software, which the industry identified as one of the key indicators of industrial competitiveness. The industry’s new perception of customers was grounded in the user and operator roles being merged into a single “user-customer,” as termed by Wang Lab. Both industries offered a diverse gene pool on which early microcomputer companies and the budding computer hobby movement depended and from which they drew upon freely. How strong and complex these dependencies were should hopefully be revealed when the research on the preindustrial period in the history of PC software moves from case studies to the cross-case analysis stage.

References and Notes
3. This definition of personal software is “hardware platform independent” because it does not imply that such software was destined exclusively for a specific type of computers, such as PCs.
4. From the late 1960s, various dialects of Basic were offered by, among other manufacturers, Data General, Digital Equipment, Hewlett-Packard, General Electric, and Wang Laboratories. According to some estimates, by the mid-1970s, Basic already accounted for nearly 70 percent of usage in schools and colleges. See D. Ahl, “On Computer Languages,” The Best of Creative Computing, vol. 1, D. Ahl ed., Creative Computing, 1976, p. 57. In 1972, the editors of The People’s Computer Company referred to Basic as a language that was “great for people” (see vol. 1, no. 1, p. 5).
6. The book was published in 2011 by McGill-Queen’s University Press.
7. The program lengths of the P-101, Wang 700, and HP9810A were up to 120, 1984, and 2036 instructions, respectively, in maximal hardware configurations.
8. Cost-effective programmable calculators, such as the Wang 700 Series, were priced between $5,000 and $7,000 depending on configuration. Wang 700 Series Commercial Price List, 1 July 1971.
9. From an MCM/700 promotional brochure, 1975. Copies of all MCM documents and promotional material discussed in this article are located at the York University Computer Museum, MCM collection, MCM/BoxA and MCM/BoxB.
11. See MCM Media/Press Release, Boston, 28 September 1973. Olivetti, Wang, and Hewlett-Packard were also toying with the idea of promoting their calculators as computers. One of Wang’s 1971 promotional brochures, entitled Wang 700: A Calculator or Computer, muddied the distinction between its calculators and computers, stating, “To simplify matters we’re calling the 700 an electronic calculator, because who ever heard about a computer for $4,900.” In a 1971 ad, Olivetti called its P-101 “the world’s most popular microcomputer” and branded itself as “the company that invented the microcomputer.” The HP 9830A calculator, introduced in 1973, was perhaps the closest to a general-purpose desktop computer. It featured a Basic interpreter in ROM and a full alphanumeric keyboard.
12. In the MCM/70 Introductory Manual published by MCM in 1973, we find, “Enjoy the privilege of having your own personal computer – it’s a privilege no computer user has ever had before the MCM/70.”
13. In 1975, MCM promotional documents described the MCM/700, a refinement of the MCM/70, as a computing device that was “sufficiently simple to allow its use by anyone able to operate an electronic calculator and an ordinary typewriter … yet sufficiently sophisticated to perform practically any task performed by a large-scale computer.” MCM’s marketing language borrowed freely from the well-established persuasion practices employed by calculator manufacturers in the past. In its 1971 Wang 700 Series: A Solution for Your Calculating Problems promotional brochure,
Wang hailed its 700 System calculator as being powerful, yet as easy to operate as a tape recorder. Almost a century earlier, Charles Henry Webb advertised its Ribbon Adder mechanical office calculator by comparing the simplicity of its use with that of the tape measure. Webb claimed that his calculator’s “workings are understood at a glance … And while the prices of calculating machines hitherto have been almost prohibitive, the Ribbon Adder is furnished at a price which brings it within the means of all.”

14. According to MCM’s 1975 price list. For more complete technical specifications of the MCM/70 computer see Stachniak, Inventing the PC.

15. The 1973 MCM/70 Introductory Manual is among the earliest MCM documents that supports this view. “It has been a combination of the complexity of the large computer machines and the complexity of the special computer languages, that has until now prevented the general public from using computers directly themselves. But the simplicity of the MCM/70 and its associated computer language (known as APL) make personal computer use and ownership a reality.” See MCM/70 Introductory Manual, p. 2.

16. AVS and EASY are discussed in detail in Stachniak, Inventing the PC.


19. These claims were made in information packages prepared by MCM for shareholders in 1973 and for customers in the mid-1970s. In the 1975 MCM/700’s promotional brochure MCM claimed that “within less than an hour of following simple step-by-step instructions, you can start programming with APL.”

20. Such claims were made by, among other manufacturers, Wang in its 1970s Wang 700 Series: A Solution for Your Calculating Problems sales brochure.

21. Other APL features, such as the awkward (to a new computerist) APL character set and the keyboard layout, were not as user-friendly as claimed.

22. This and subsequent comments by Cam Farnell come from email correspondence between Farnell and the author that took place in July 2014.

23. From MCM/700 and MCM/800 promotional literature. The MCM/700 and MCM/800 computers were introduced in 1975 and 1976, respectively.
Management, U.C.L.A. We also used another book by Buckley and colleagues called Management Problem Solving With APL which contains thoroughly documented APL program listings and sample results based on the theory from the first book. b) We adapted programs from the above APL book to run on MCM desk top computers to form complete packages ... Should you want to alter the programs, with or without MCM assistance, there is an excellent APL reference text to follow. Should you wish to brush up on your accounting or financial theory or check the logic behind any MCM financial program, you can refer to the accounting


41. According to some estimates, between 1978 and 1982 personal software sales in the United States increased 27-fold, from 413,000 packages to 12.5 million packages. In particular, the sales of educational and entertainment software increased from 28,000 and 200,000 units, respectively, in 1978, to 1.49 million and 7.67 million, respectively, in 1982. Data quoted from E. Juliussen and P. Isaacson, “Personal Computer Software Industry Perspectives,” and E. Juliussen, “Entertainment Software,” Future Computing’s Personal Computer Software Industry Forum, conference documents, Richardson, Texas, 14–15 June 1982.


43. The second and revised edition of Ahl’s book was published in France, Germany, Japan, and The Netherlands, making games, such as “Spacewar”–a variant of Mike Mayfield’s “Star Trek”–some of the most popular early entertainment software for microcomputers worldwide. See also endnote 45.


45. In an ad placed on the cover of the June 1978 issue of the Japanese magazine Gakusyu-Computer, NEC sets up a classic “I want you to buy me” game between a father (the technology provider) and his son Takashi (the enthusiastic youth and NEC’s agent of change). Programming one’s own computer features prominently in the ad:

One day, after his visit to Akihabara [Tokyo’s renowned consumer electronics district, where in 1976 NEC opened its famous microcomputer showroom Bit-Inn], my son told me:

- Dad, I want a microcomputer kit.
- Oh?
- It’s a microcomputer!
- Yes?
- I really need it.
- Then tell me, what can you do with it?
- Dad, it is not what, but how. I can program a microcomputer to do what I want, and then I can run it to do that for me.
- Well …
- OK, Dad?

Takashi’s father bought the computer, and now his son is working on a new game with his friend Hashida. “What kind of a game will they create on the Takashi’s microcomputer? Would it be better than Star Trek?”

46. The Apple II Basic Programming Manual, Apple Computer, 1978, begins with the proclamation that programming is easy. “This manual will show you how to plug in your APPLE II (easy) and be a guide as you learn to program it (also easy).” Then there is the “programming is fun” part: “If you are a Newcomer to programming, you will … find many features and conveniences in APPLE BASIC that make programming a lot of fun.”

47. Sources: NEC Compo 80/BS and PC-8001 data sheets as well as data published by the Information Processing Society of Japan, at http://museum.ipsj.or.jp.


49. See endnote 41. For further in-depth analysis of the early PC software industry, see Campbell-Kelly, From Airline Reservations to Sonic the Hedgehog.

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