Twenty-Two Columns of Lowbrow Revolution
The Commodore VIC-20 and the Beginning of the Home Computer Era

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Abstract

This article examines the development of the VIC-20 computer system as produced by the American computer company Commodore International during the early 1980s. This analysis demonstrates that thanks to the requirements of the American computer market in the early 1980s, those responsible for its development acted more like a team of collaborative artists rather than a true, by-the-book engineering team. This allowed them to develop the first computer that sold over one million units and created the home computing market. This analysis also demonstrates that this form of development no longer has a place in today's computer development world.

Keywords: Collaborative art, commodore international, computer history, engineering history, home computing

Figure 1. The VIC-20 with standard accoutrements and retail packaging. Photo used with permission and courtesy of Maria Love

Introduction

Today there are two dominant home computer platforms: the semi-proprietary Apple iMac line and the more flexible "PC" systems named after the original IBM 5150 Personal Computer that debuted in August 1981. But in the late 1970s and at the dawn of the '80s, there were myriad choices available to the consumer such as Sinclair's ZX80 and ZA81, Radio Shack Tandy's TRS-80, Commodore's PET, and most famously, Apple Computer's Apple II.

However, somewhat obscured by its latter, more highly praised siblings,[1] the Commodore VIC-20 was launched in Japan in September 1980 (as the VIC-1001) in order to slow NEC's advance into the home computing market, and then in the United States in January 1981 in attempt to create an entirely new market - the home computing market. Its retail price in 1981 was $299 (567890-)($800 in 2017's dollars), which was the first color computer to break the $300 barrier. On top of its low price, the VIC was designed specifically to be "friendly" to the home user—something no other computer had done before—and this "friendliness" was extended to its case design, users manuals, and even its keyboard. In an early review, noted technologist Dr. David D. Thorn-

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[1] In 2007, PCWorld ignominiously ranked the VIC the seventh worst PC of all time, calling it "undeservingly beloved"

burg wrote that this appeal to children and first-time home users would "create its own market, and it will be a big one" (Thornburg, 1981).

Thornburg was more than right. By the end of 1982 VIC became the "most ubiquitous computer" in the world, with over one million units on the sold, the first computer of any kind to reach this mark (see differences in sales estimates between: Rochester & Gantz, 1983, p. 182; Commodore Business Machines, 1982; Wood, 1984, p. 5). Jim Butterfield, a computer engineer long-associated with Commodore computers, believed that the VIC "attracted…not just game players...but people who hadn't been able to afford a home computer before" and that it was "the best machine for hooking up to a TV set" with "its large 'plump' letters [that] were easy" for anyone to read, including large groups (Butterfield, 1996). But, the VIC was not simply a computer, it was an entire system. Unlike today's well-established duopoly, Commodore attempted to create an entire market for their computer, which necessitated not only the computer, but all of the accoutrements to go along with it since the computer was brand new, and there was no time to distribute pre-release copies.

Creating computer systems, including hardware, software, and peripherals, makes for a clear-case historical engineering study, but if one were to examine the engineering undertaken to create the VIC-20, it actually resembles a collaborative art project more than an idealized engineering assignment, similar to many of the popular computing projects of its era. The burgeoning home computer market in the 1980s and the relative simplicity of computer and software design fostered and necessitated an environment that made the early '80s was "the last era where a designer could sit down and designed something on his desk and have it go out to millions of people" (Walliser, 2016). As such, the development of the VIC-20 is a type of marker in the history of consumer computing design at the start of the home computer age in which products were hastily developed in a manner unsuitable for today's development environments. This is particularly apt since the teams working on the VIC-20, like many systems designed during the era, were required to produce everything necessary to run them, including not only the actual computer itself, but much of the software and many of the peripherals to go along with it. Since one of the overarching goals of the VIC was to be "friendly," its developers had to take special care to ensure that everything, from the keyboard itself, to the data storage devices, the software, and even the user manual, were digestible by the pubic who could then use the resulting product for whatever they saw fit.

Computer Development as Art?

Of course, the view of computer designers, engineers, and the accompanying personnel who write the instruction manuals and program the accompanying software runs against the mimetic ideal of the long figure sitting in front of a canvas, his paints and brush the ready. However, as historian of collaborative art projects Charles Green noted, "such a clichéd figure is deeply embedded in media representations of artists, in market valuations based on authenticity and originality, and in so much public discourse that it is generally perceived as 'normal'" (Green, 2001, p. ix). In this study of post 1960s post-modern collaborative art, *Third Hand: Collaboration in Art from Conceptualism to Postmodernism,* Green describes a situation found by the collaborators on the VIC, who were seeking to break open the home computer marked with their inexpensive, friendly, color computer; to wit: "looking closely at works by artistic collaborations, I discovered that artists found collaborations and other, modified types of authorship necessary to answer pressing questions facing contemporary art" (Green, 2001, p. xi). A simple definition for collaborative art can be found in Sondra Bacharach, et. al.'s *Collaborative Art in the Twenty-First Century,* in which they describe the process as one in which "not everyone [has] all the materials, skills, and background to engage in art-making, or specific projects, so [the artists decide] to work together" (2016, p. 1). More pragmatically, when artist Sheridan Quigley spoke about a 2016 project she undertook to "[bring] together disabled and non-disabled students" from several London-area schools to paint outdoor murals and to work with willow to create temporary outdoor sculptures, she saw these collaborative art projects as the bringing of people together with "a wide array of skills and interests that they have gained from all sorts of experiences…regardless of their particular circumstances." The idea was not to equalize output, but about contributing "as whole-heartedly as possible…not about having to produce work that can be graded or formalized, but about [contributors] expressing themselves, their imaginations and their emotional responses" (Create Arts, 2016). This, of course, does not reflect an engineering ideal, but a creatively human one.

Traditionally, computing corporations such as Digital Equipment Corporation (DEC), Wang Labs., IBM, and the ilk, generally attempted to impress upon its programmers and designers a sense of engineering, albeit with mercurial successes over the decades. In 1998, well-known computer scientist Steve McConnell wrote a summary "best practices" article in which he acknowledged that programming still did not live up to its engineering ideals, but believed that, "unquestionably," the it should do so going forward (McConnell, 1998). But there is something creative about computer software (and by extension, the rest of the process) that most engineers are quick to identify. Dariusz Jemielniak, a professor of management at Poland's Kozminski University provides this helpful framework for this study in "Software Engineers or Artists? Programmer's identity choices" (2008). Jemielniak argues that the overarching understanding of software development centers on engineering when "software is by no means a physical construction" and found that programmers saw their task as an "artistic hobby," measured "creativity" as "crucial to their job," considered programming an art form, and constantly "used aesthetical terms to describe their work" (pp. 20, 24). Out of the professionals surveyed (56 software engineers plus four managers) several described their work as similar to poetry and other commentators have liked coders to that of a musician and other artists who experience "moments of mystical enlightenment" (Jemielniak p. 27 and *passim;* Lyman, 1995). Jemielniak concluded that the "artist" view of software engineers was in "direct conflict with predictability

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and standardization, especially in organizations expecting uniformity," but, by and large, "software writing is define at least as much within the concept of art as within the idea of engineering" (p. 25). Jemielniak's ideas are not new, however - in 1984 Steve Ditlea, a long-time technology commentator, opined that "software encourages alternative thought processes" and believed that successful software engineers were "equally comfortable with the abstractions of technology and the emotions of the heart" (Ditlea & Lunch Group).

The Inception of the VIC-20

The computer industry was on the threshold of great change in the late 1970s. The hardware that was once an esoteric of the corporate or the rich was now moving into the price range of serious hobbyists. The first computer to seriously broach the at-home (but hobbyist) market was the Altair 8800, which sold in kit form beginning in January 1975 for $440 (~$2,000 in 2017), fully assembled for $621 (~$2,800 in 2017) (Young, 1998). In this form, the computer ran a reasonably powerful 8800 processor, but lacked a storage device, monitor, and even a keyboard—all programming had to be done manually using opcodes via switches on the front panel. The "1977 Trinity" of home computers were more practical and less expensive, but the Apple II ($1,298, keyboard only), the Tandy/Radio Shack TRS-80 ($399, keyboard only or $599 with monitor and cassette tape drive), and the Commodore Personal Electronic Transactor 2001 (PET; $795 with mandatory keyboard, monitor, and tape drive). All in the Trinity were monochrome computers, but the Apple II was "color capable" if one paid for an upgrade. However, the costs of these computers were still prohibitive for much of the buying public ($5,200, $1,600/$2,400, and $3,200 respectively in 2017). Not only were they expensive, but these nascent attempts to create a market simply did not consider the untapped potential of the home computer market.

Thanks to the success of its PET, Commodore was a large company, but the team that designed the VIC-20 did not conform to most corporate norms and would have probably been happy with being called "artisans" or "craftsmen." The company itself was not a flash in the pan looking to make an initial foray into computers like Apple. By the time it incepted the VIC, Commodore International, the parent company of Commodore Business Machines (CBM), had been in business for nearly 25 years, founded in 1954 as a Toronto-based typewriter company by Jack Tramiel (pronounced "TRAH-mel"), an American immigrant-survivor of Auschwitz. In the early '70s, the company began making one of the first pocket LED-display calculators, but it was simply too expensive as integrated circuit companies not only made the chips powering them, but began to manufacture calculators, themselves (this same problem plagued CBM's previous typewriter and adding machine manufacturing interests). Not to get caught in the same supply trap again, CBM purchased the semiconductor manufacturer MOS Technology (MOS) in 1976, which produced not only the microprocessors being used in their calculators, but many of the support chips necessary to build full-fledged computers.

The chief architects of the VIC's development and launch were Tramiel and his chief assistant, Michael Tomczyk, whom he hired on April 1, 1980. Tramiel and Tomczyk were both like-minded individuals who did not believe in rules, an attitude shaped by their earlier experiences. Tomczyk even turned down a potential job at Apple after a direct invitation from Steve Wozniak, primary because he was "not a 'rules' person" he was "a rule-breaker" (Egger, 2010). Tomczyk cut his creative teeth at the University of Wisconsin-Oshkosh where he majored in English Literature with minors in journalism and Spanish, all while being a student photo editor and photo journalist. After graduating in 1970, he served as a public information officer for the XCIII Airborne Corps both at Ford Bragg and in Vietnam and attained the rank of Captain before mustering out in 1973. While in Vietnam, he "felt the hot steam of combat" while lying on his "belly in the jungle…realizing the only thing between [him] and a bullet was a bunch of green leaves." Eventually, he was awarded the Bronze Star. Although did not care much for the realities of the command structure, Tomczyk believed his stint in the military gave him a sense of calm under pressure and he chose Hemmingway's "courage is grace under pressure" as his favorite quote (Tomczyk M. S., 1984). After returning stateside, Tomczyk earned his MBA at UCLA and went to work as a general manager at a San Francisco-based media and special effects company that worked on movies such as *Logan's Run* (1976) and *Time After Time* (1979) (Egger, 2010).

Tramiel's background played just as important a role in the development of the VIC. During World War II, his Polish family was rounded up and eventually sent to Auschwitz where Tramiel's father eventually perished. Eventually, Jack was road-ganged to work on the Autobahn system until his rescue in April 1945. Although certainly bitter in many ways about his experiences, Tramiel said that he harbored no ill-will toward the German people. Instead, he blamed the Holocaust and the nation's eventual downfall on the German people's ready-acceptance of dictates. "They just obeyed the rules," Jack opined about Germans who were "locked in a system" bounded by their government's mandates. "Americans," he concluded "like to make rules, and that scares me." Because of this, CBM needed "mavericks, just so the rules don't take over" (Tomczyk, 1984). Accordingly, Tramiel did not believe in product managers and often hired staff on a sink-or-swim basis who could be fired along with nearly their entire division owing to Jack's "cancer theory" of personnel management. Michael Tomczyk likened him similarly to Captain Fletcher from the ill-fated H.M.S. Bounty, "damning the stiff-upper-lips and their abominable rules, sailing his ship on an uncharted course toward an island he knew must lie just ahead" (Tomczyk, 1984).

Tramiel believed (rightfully so) that if American companies were not careful, the Japanese, thanks to their vertical integration and governmental support, would take the home computing market out from under them, just as it had done to the compact automobile and consumer electronics markets. In a meeting near London on April 15, 1980—just fourteen days after Tomczyk's start date—Tramiel dropped a bombshell on a large group of engineers and sales managers, instructing them to create, market, and sell a color

home computer for under $300. This sent the entire room into an uproar of debate. Tramiel refused to participate and waived away anyone attempting to speak to him about it. After about twenty minutes, Jack pounded his fist on the table and said "in his deep booming voice: 'Gentlemen, the Japanese are coming, so we will become the Japanese!'" (Tomczyk, 1984). Tramiel had no explanation for this price point, other than he felt once a computer breached this line, "the home-consumer market would open up like a flower."

When looking at the development of the VIC, it is important to know that Commodore, according to Tramiel, was not a computer company. It was not even an engineering company. Tramiel described it as a sales-driven "marketing company," more than anything and this belief allowed CBM to produce a workable and cheap home computer where other companies had failed in the past (Tomczyk, 1984). It also allowed the computer to be designed quickly, with minimal bureaucracy thanks to an overall marketing strategy that drove the engineering, not the other way around.

The Sculptors of the Hardware

One of the greatest transfers of technology from MOS to CBM was not a chip, but a person—Chuck Peddle. Although not as popularly famous as Bill Gates or Steve Jobs, Byte magazine opined that he, "more than any other person [deserved] to be called the founder of the personal computer industry" (Lemmons, 1982), while the magazine Computerkurs (Computer Class/Course) stated his contributions more bluntly: "Chuck Peddle designed and developed the Personal Computer" (Computerkurs, 1984). After graduating from college in 1959, Peddle went to work for General Electric, but his true contributions to the personal computer world began in 1973 when he went to work for Motorola and worked on several microprocessor projects, including the groundbreaking 6800, which he believed to be the first real microprocessor CPU that was not simply a "calculator chip" (Computerkurs, 1984; Bagnall, 2006, p. 11; Matthews, 2007). While groundbreaking, Peddle felt that the chip's main flaw was its $300 "low cost" price tag, and began to work on a true inexpensive version. The 6800 actually became "too successful," and after returning from a business trip, Peddle found a letter on his desk "formally instructing [him that] Motorola was not going to follow a cost reduced product" and he was "ordered to stop working on it" (Bagnall, 2006, p. 10). Undeterred, he began to look outside company walls for a backer, which he finally did in MOS, a company looking for new ideas and products. There, along with a group he poached from Motorola, he designed the 6502, the $25 CPU at the heart of CBM's first machine, the PET business computer (and, later, the VIC-20).

Peddle's group began meet and collaborated with "computer enthusiasts, educational institutions, and main frame corporate users" where he was able to learn that what people wanted most was a "computer that looked like a terminal," with the keyboard, central processing housing, and monitor all in one place. This collaboration helped develop the specifications for the PET, but that computer's primary weakness was that it was in monochrome and the Apple II was designed as a color computer. In order to build an "Ap-

ple killer," Peddle's group had to modify MOS's in-house, 22-column, color, model 6560/61 Video Interface Chip (VIC) graphics chip to accommodate a 40-column display in order to match the Apple II.

Even though Peddle's group would take some time to develop a 40-column color VIC chip, Tramiel wanted something colorful to show at the January 1980 Consumer Electronics Show (CES), which required the 22-column 6560/61. This proved to be the genesis of the VIC-20 computer. Bill Seiler, a west coast electronics engineer (part of Peddle's group) with a "massive, unkempt beard and long, blonde ponytail that stretched all the way down to his waist" began to work on a "G-Job," (short for "garage job") or "fun project that engineers at Commodore did on their own time" (Bagnall, 2006, pp. 141-2; Seiler, 1996). A "curious man by nature," Seiler was known to become so engrossed in "technology that he forgot his surroundings" (Bagnall, 2006, p. 142), which gave him a reputation for looking at the world as if a child (Peddle commented that he kept focused "on warm and fuzzy and friendly" [Bagnall, 2006, p. 143]). The computer he designed did not stray from this ideal—he designed it for children and thought it would make a good gaming machine prototype. After hacking apart a PET computer and cobbling together parts from around the MOS plant (including out of the trash), Seiler managed to finish a working, demonstrable prototype in time for CES. Unfortunately, Tramiel was not impressed, as he expected to see the Apple killer at CES, not the computer designed for children.

Apple killer it may not have been, but the prototype VIC-20 was given another opportunity when a young, brilliant engineer straight out of college noticed that MOS largely ignored the 22-column VIC chip and wanted to demonstrate its potential. Robert "Bob" Yannes, had actually worked with the chip for his senior college project and believed that its color capabilities and low cost opened up avenues for inexpensive color computers (Bagnall, 2006, pp. 157-9). Yannes began work on his own G-Job (actually out of his bedroom) and created what was basically a demonstration machine with built-in, unchangeable firmware that "[discussed] the features of the machine" and demonstrated the VIC chip's smooth, scrolling text routines while music played from the chip's on-board sound processor. The entire demonstration was in black and white, until the end, when "it went into [a] color kaleidoscope program" (Bagnall, 2006, pp. 161-2). Eventually, it sported a PET keyboard and a custom made case made "out of some sheet plastic [Yannes] had lying around" (Bagnall, 2006, p. 160).

In May 1980, Tramiel stopped by MOS's east coast facilities for a general managers' meeting where Yannes could finally demonstrate the potential of the VIC chip to him, but this simple meeting turned into much more. Fresh off of his "we will become the Japanese" speech just a month prior and still angry at Peddle for not giving him an Apple killer in January, Tramiel fell in love with not only the demonstration, but the "computer" Yannes created, as well. What was literally a bedroom project had now turned into a demonstration to be shown at the June CES, "a mere two weeks away" (Bagnall, 2006, p. 162). Understandably, Peddle was disappointed in this recent turn of events, and he would not let the

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young, east coast upstart overshadow his west coast team. He and his team immediately began to work on another prototype based on Seiler's and quickly created a fully functional computer using the PET's architecture, which allowed them to form a fully-functional computer with a PET keyboard, case (actually an old Commodore calculator case), operating system, tape drive, and BASIC interpreter (Bagnall, 2006, p. 166). Both were shown at CES, but Peddle's version was an actual computer, not simply a demonstration board. In the end, both groups sat down to cordially discuss how, "together, they could develop something special" (Bagnall, 2006, p. 167).

The "something special" they discussed would become the VIC-20, and Tramiel finally had his "Japanese killer" computer. In fact, he was so elated by the computers produced by the two groups, he ordered a production model completed within the next month. Peddle and the rest of this team were dedicated to building the next Commodore business computer to replace the PET (codenamed "TOI"), so the assignment was given to Robert Russell, a west coast software engineer who named the project "Vixen." Since Russell was primarily a coder who was "pretty much abandoned" by the rest of Peddle's group, he brought Seiler back into the mix. Russell remembered that he had "almost complete freedom" to work on the Vixen since, at Commodore, "there was no real head of engineering…just engineers who had the responsibility to get things done" (Bagnall, 2006, pp. 169-71). Not only that, Russell held Tramiel's favor, and could drop his name whenever he needed to get something done. In the end, he and Seiler designed the VIC's memory add-in board, the tape cartridge port, the tape drive connector, serial port, and all the associated code tying it all together. In a month, the team was finished with the sculptured electronics that were the heart of the VIC-20.

Painting and Display: The Rollout and Marketing of the VIC

Although the VIC was now a real computer, the west coast team's product was really nothing more than a board design and associated firmware. Obviously, one could not simply ship a patched circuitboard to customers and hope for the best. To complete the project, the prototyped system had to go through another team of craftsmen who could turn it into something purchasable. The head of this effort was Michael Tomczyk.

Tomczyk was not officially product manager (again, Tramiel disdained them), but Tramiel made sure all decisions were run by him, and his influence on the early development of the VIC was paramount. He saw the great potential in smaller computers when Atari Corporation asked his company to beta test the Atari 8-bit computer (the company's first foray into the personal computer market) in 1979. Tomczyk liked the computers, but felt that Atari made several mistakes in the marketing that drove both the public and computer hobbyists away from their machines. First, Atari refused to make available technical details available on their machines publically available, thus alienating "alienated the fiercely independent hobbyist/programmer community." Secondly,

Atari did little to distinguish their computers from their market-dominating 2600 game system. "Who would buy a serious computer from the world's most successful videogame and arcade company?," Tomczyk thought to himself, later concluding that "many customers thought the Atari 400 and 800 were more expensive versions of the Atari 2600 videogame machine." Thirdly, he believed that computer companies had not yet created believable marketing information that honestly touted a particular computer system on its strengths and weaknesses. Of the potential computer-buying public, Tomczyk believed that "many young adults who were in the right age group to buy computers still didn't trust all the advertising because they were raised in the 1950s before truth in advertising began to be enforced" (Tomczyk, 1984). The lessons Tomczyk learned from Atari's unsuccessful foray into the home computer market and Tramiel's belief that Commodore's products were driven by marketing helped him develop the VIC as a simple, affordable, and expandable computer that could grow inexpensively as the user required. Tramiel and Tomczyk both felt that the VIC-20 was the "computer for the masses." No longer relegated to hobbyist/enthusiasts or those with money, the computer Commodore developed was the computer of the future, and a major driving force for Tomczyk who "personally wanted to make sure the VIC-20 turned out right."

In order to make the VIC both honest in its marketing and the computer for the masses and the future, the message behind it had to be simple, straightforward, and candid; with this in mind, the sole focus of the computer was to make it truly user friendly (at least by early 1980s standards). From the first meeting in Santa Clara onward, Tomczyk repeated the "prime directive" (a term familiar to *Star Trek* fans) for the VIC: "User Friendly." The phrase was so important that Commodore trademarked the phrase "The Friendly Computer," to act as the VIC's slogan, thus not only making the point, but denying anyone else's computer claiming "friendly" thanks to copyright restrictions. According to promotional literature, the VIC was designed to be "friendly in price, friendly in size, and friendly to use and expand" (Commodore International and Avalanche Productions, 1981, p. Back Cover). In the end, Tomczyk maintained "friendly" was the computer's "most important feature" (Tomczyk, The First Home Computer, 2012; Egger, 2010).

In order to ensure the hardware was done properly and inexpensively, Commodore's Japanese engineering division would design the final board, case, and manufacturing process. Tramiel only trusted Tomczyk to work with Tokyo, so he only allowed him to communicate with the general operating manager and vice-president, Taro "Tony" Tokai and his head engineer, Yasaharu "Yash/Yashi" Terakura. Terakura was well-liked by Stateside engineers and his personality matched the VIC. He even gloated that the VIC "will be a friendly computer, because I am a friendly engineer!" (Tomczyk M. S., 1984). One of the first projects they took on was the case design, which fulfilled the "friendly" mantra by eschewing "right angles and sharp corners," and, instead developed a case "with smooth rounded edges," which made the VIC look "like a cozy pillow with a CPU inside" (Bagnall, 2006, p. 183). Tokyo was also responsible for ensuring the product sported a full-sized, full-stroke keyboard,

because this was "friendlier" than the plastic membrane keyboard sported by most other inexpensive computers or the "chicklet" keyboard used by the PET. On top of the physical keyboard, Tomczyk demanded it have large and readable letters, be colored in a specific manner, include a pound symbol for their British customers, feature function keys to make it more accessible, and have character graphics and color codes displayed directly on the keys so that programmers did not have to use obscure character codes in order to access them (Tomczyk, 1984). [2]

Figure 2. Even the graphics capabilities and keyboard of the VIC-20 were designed around user friendliness. The three graphical characters in Line 20 are typed directly from the keyboard using Shift+M, Shift+W, and Shift+N. The "CLR/HOME" key is an actual key on the keyboard and when pressed, will display within quotes similarly to what is shown on Line 10. This program, from page 52 of Personal Computing on the VIC-20, will render an animated person doing jumping jacks (Commodore International and Avalanche Productions, 1981).
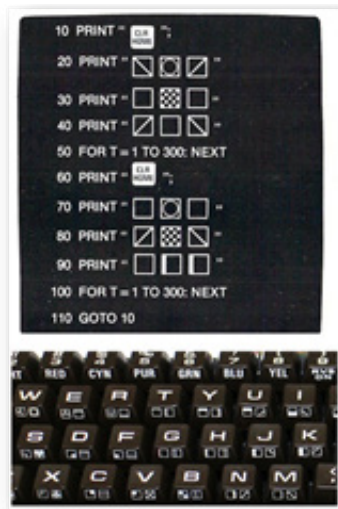

Once the hardware was under control, Tomczyk had to create a Stateside team to market the product, design its packaging, and create both add-on software and hardware in order to make a complete computer system. The team built to implement the VIC's rollout was "a small team" of mostly young computer programmers who were used to working both quickly and independently. This team was called the "VIC Commandos" (a nod to Tomczyk's military past) and any idea or proposal not meeting the "prime directive" was rejected (Egger, 2010; Tomczyk M. S., 1984; Tomczyk M. S., The Story of the VIC, 1982, p. 4). The Commandos were spread out across Commodore's large corporate infrastructure from its home office in Valley Forge, to Toronto, San Jose, Santa Clara, London, and Tokyo. Tomczyk raced from coast to coast to gain ideas for the VIC, and then to Tokyo where many of the final product's engineering decisions were made. The price was set at $299.95, because it was under Tramiel's $300 price directive and the numbers made for a "friendly price" according to Tomczyk (Tomczyk M. , The First Home Computer, 2012). Even the name, the VIC-20 held to the prime directive, with "VIC" being taken from

the computer's VIC chip, and the "20" added on because "VIC," alone, sounded like a trucker's name and "twenty sounds friendlier" than "22," which was the number of columns of text produced by the 6560/61 (Tomczyk, 1984).

Tomczyk eventually made a mistake, which reduced some of his influence over Tramiel and the VIC's rollout when he designed "unfriendly" marketing materials for it. The promos, which featured the VIC "floating in space and a bolt of lightning" rankled Tramiel who was not a technical person, but was the marketing soul of the company. Tomczyk's workload was cut and he was put in charge of creating the rollout software, users guide, and a separate programming manual (Bagnall, 2006, p. 202). To replace him, Tramiel brought in Kit Spencer who redesigned the marketing literature and chose a spokesperson. At the time, William "Bill" Shatner's popularity was resurgent thanks to his appearance in the 1978 movie, Star Trek: The Motion Picture, so he was recruited for a series of print and television advertisements and convention appearances (Bagnall, 2006, pp. 209-10; Tomczyk, 1984).

Figure 3: This advertisement is from Shatner's first photo shoot from a series of ads created by Kornhauser & Calene in which he is wearing a grey business suit from Bloomingdales. An unseen tagline touts the included user manual: "This 164 page guide tells you everything you need to know about your VIC-20 and how to operate it. Written for the beginner, you'll be programming on your VIC-20 minutes!" Note that the ad displays the slogan "The Friendly Computer" two separate times.
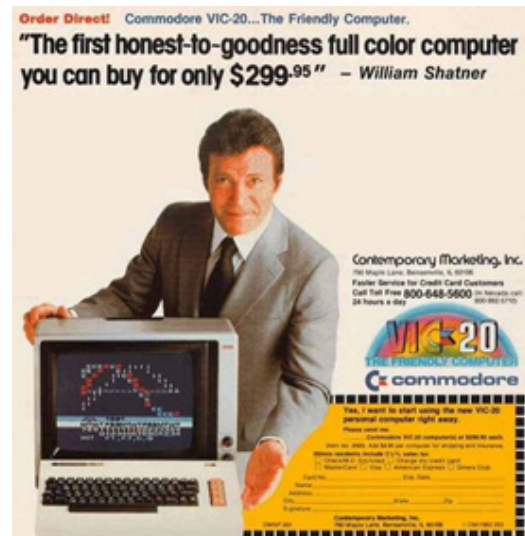

In his new rollout group, Tomczyk hired Andy Finkel as part of a two-man software development team (Finkel, 1996). In addition to accepting the VIC Commandos moniker, he described his group as a "tiger team" since they had to work so quickly and described his work as a combination of "writing the [demonstration software], fixing the Japanese cartridge software,…testing the hardware and software from engineering,…working on the manuals,…providing tech support for the TV commercials, [and] talking to developers" (Finkel, 1996; Walliser, 2016). One of Finkel's most outstanding memories was the fact that the VIC forced him

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[2] Interestingly, numerology is important in many Asian societies, and in Japan "20" was not as "friendly" as "1001."

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to "[cheat] all over the place to make up for the limitations of the hardware" (Walliser, 2016). As the number of Finkel's tigers grew, he was given more space in a separate building where they "developed a fun atmosphere, away from management interference" (Bagnall, 2006, p. 204).

One of the factors holding computers back from being accessible to the general public were its often cryptic and poorly written manuals; Tomczyk needed to rectify this so that home users were not so intimidated. *Personal Computing on the VIC-20,* the VIC's user manual, was designed so that someone "with no special expertise to use, apply, or enjoy" could understand the computer. The manual, designed to teach the BASIC programming language, all but eschewed the word "programming," and, instead, emphasized the word "compute," which the Commandos interpreted as "meaning 'to have fun'" (Tomczyk M. S., The Story of the VIC, 1982, p. 7). Although the manual was linear, it was designed chapter-independently; if one wanted to write computer music, computer graphics, or basic programming frameworks such as loops and gotos, one only need to turn to that chapter and not proceed through the book from the first page forward. In order to make the computer friendly to hobbyists (unlike the aforementioned Atari 400 and 800), the *VIC-20 Programmer's Reference Guide* was released at the same time as a separate title.

Figure 4: The computer's 164-page user manual, *Personal Computing on the VIC-20: A Friendly Computer Guide,* was designed to be easy to use with large fonts and the occasional appearance of the smiling anthropomorphic "VIC" mascot to make computing less intimidating to novices (Commodore International and Avalanche Productions, 1981, p. 10).
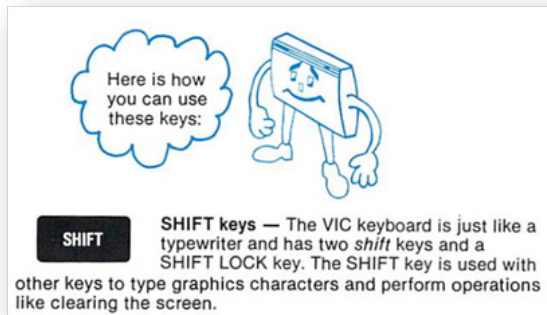
The computer was designed to expand primarily through inexpensive, easy-to-install hardware. The VIC only had five kilobytes (5K) of onboard memory, but inexpensive cartridge expansions allowed users to add more RAM. The VIC did not have any on-board, non-volatile storage, so Tomczyk decided to promote the already-extant Commodore 1530 Datasette - a storage device created for the PET that used a standard compact cassette on which to store data - that was already being made in bulk for the inexpensive price of $89 ($240 in 2017; external floppy disks were several orders more expensive). In order to give VIC users access to the nascent world of networked computers, Tomczyk enlisted the services of Bert Weiss, who contracted with George Eisler's small engineering company to modify one of its 300 baud commercial modems to fit in a cartridge and to cost less than $100 (most modems cost over $400 at the time). Eventually, the modem, dubbed the Model 1600 VICModem

Telephone Interface Cartridge, was released in March 1982, along with a trial subscription to CompuServe (one of the pioneers of commercial dial-in networks). CompuServe was a "full feature" system that allowed users to dial in and check stock market prices, sports scores, encyclopedia entries, and the like. It also teamed up with Commodore to create the *Commodore Information Network,* which was an "electronic magazine" for Commodore users where they could read the latest news and seek help and ideas from both Commodore-employed experts and other independent hobbyists (Tomczyk M. S., 1984). In time, six college students were hired to man the "Commodore Hotline," the company's first in-house product support group available to the public.

The VIC's Release and Short Life

When the press took hold of the new computer, response was generally positive, with most acknowledging the VIC-20 team's ability to make a computer that was both inexpensive and user friendly. Complaints, if any, usually centered on the scant number of peripherals and the limits of a 22x23 column display. New Scientist called the VIC the "Model T home computer" and raved that they had "seen the future of home computing and it's the VIC-20." The magazine correctly surmised that "a lot of thought [went] into [the VIC-20]" in order to create a "superbly designed and versatile machine at a reasonable price." "Without a doubt," the reviewers wrote, "the VIC is the best-value-for-money home computer yet produced, with all the appeal of a video games system…in the same package as a genuine computer." Continuing their praises, the magazine stated that "colour manipulation is the easiest we have ever come across" and its usability was accentuated "by a handbook from which a nine year old can, literally, learn to operate it and begin to write in BASIC." New Scientist was, however, somewhat critical of the lack of peripherals and the VIC's lack of "sophistication" (Gribbin & Gribbon, 1981, p. 920). Stan Velt of Popular Electronics wrote that the VIC was an "excellent design" and was "more computer for the money than we had expected to see." Velt felt that the VIC offered "an excellent low-cost way for a person to start computing, yet…enough programing capability [existed] to maintain interest and learn programing, graphics, and the fundamentals of music." Of course, the entire family could join in since "users can always take a break by plugging in a cartridge to play a wide variety of games." In summary, Velt believed that "The VIC-20 has real computer capability, as well as being a commendable games player and educational tool" (Velt, 1982). Writing for Compute!, David Thornburg noted the computer's compactness that made "the VIC fit easily into almost any imaginable home location location—a feature which other manufacturers have yet to understand." Although he found the "22 character display to be too small to support any but the most rudimentary business applications" he conceded that "at a price of $299, that is hardly the point" since "the VIC is a much more valuable computer literacy tool than…any of the similarly priced single board computers which have been on the market for several years" (Thornburg, 1981, p. 39). Byte! magazine called the VIC "unexcelled as a low-cost, consumer-oriented computer," that was "well designed and easy for the

novice to use." The reviewer noted Commodore's excellent documentation, which was "informal, friendly, and respectful of the reader's intelligence, but it assumes no previous knowledge of computers." Byte! also noted the two Introduction to… book/cartridge combos on computing and BASIC programming that were "innovative" because the book/cartridge pairing allowed the reader to learn programming "without the drudgery" of typing all the code, themselves (Williams, 1981, p. 64).

Over the next year, Commodore remedied the shortfall of peripheral and software packages (the latter thanks to their willingness to work with external programmers) by October 1982 that Byte! declared the VIC "one of the better-supplied computers on the market" (Velt, 1982, p. 39). By then the VIC had also reached the apex of its expandability, with RAM expansion cartridges at various prices and even a 40/80 column text cartridge manufactured by Quantium [sic] Data for $199. In terms of software, the titles available for the VIC ran the gamut: over "530 commercial games, 35 application, 30 educational titles, and 15 programmer utilities" were created for the VIC (Bagnall, 2006, p. 219).

With the release of the Commodore 64 (C-64) in August 1982, the VIC was on borrowed time. During 1983, the price for the VIC dropped from $180 in January, to $140 in February, and to $100 or under by the start of summer (Mitchell, 1983, p. 4). Soon after its release, the C-64 was price-reduced during the year from $600 to $300, but discount retailers started selling it for under $200, thus increasing CBM's home business share from 23 percent to 50 percent, selling more personal computer than all other companies, combined (Mitchell, 1983, p. 34). Throughout 1984, retailers began liquidating VICs for as low as $79 and prices for VIC-related software and cartridges dropped in kind (peripherals did not, as they were C-64 compatible).

In February 1985, the Toronto PET Users Group's magazine published "Sunset Days for the VIC 20?" in which admitted that the computer "to grow on" would not be "the one to grow old with" (O'Brien, 1985). But after "three years" (it was actually closer to four) of computing with the "wonderful features and" a "goofy" screen, the VIC was already obsolete. "It was hardly the 'user friendliness' that people were looking for when they bought the machine," but the writer found its clearance price tag - a mere $79 - made buying into its flaws "comforting." All that was needed to help the VIC-20 soldier on into the future were "ideas" featuring "cheap hardware modification coupled with software support from the usual sources" of "users groups and magazines" could "give new life to the VIC 20 and its user." It, however, was too late; the die had been cast, newer computers were more powerful and inexpensive, and the VIC quickly faded into computing obscurity.

Conclusion

The VIC might have had a relatively short time atop the heap before losing ground to its more advanced sibling, the C-64, but it still managed to sell over 2.5 million units during its entire run, ending in January 1985. At one point, 9,000 VICs were being produced monthly at its production peak

and the television technology show Computer Chronicles "credited the VIC-20 with started the home computer phenomenon" (Bagnall, 2006, p. 221). The success of the "pillow computer" even surprised Tramiel, who found himself heading a $500-million company, worth tenfold what it had been before the VIC debuted (Bagnall, 2006, p. 222).

Nostalgic reminisces from those associated with the VIC-20 demonstrate that they all knew that something special was happening, and that the mix of people and the atmosphere of experimentation helped the computer come together. Even though he was mainly interested in his TOI project Chuck Peddle fondly thought of the VIC as a success. "Successes have many fathers," recalled Peddle when thinking of the entire design and rollout team, "and in this case, it did have many fathers" (Bagnall, 2006, p. 181). Andy Finkel enjoyed the "lean," unstructured environment of Commodore in which one could "define [their] own job" (Finkel, 1996). Al Charpentier, an engineer that worked on the VIC graphics chip and was heavily involved in the C-64, believed that one of the most important accomplishments of the computer was that "no one knew the proper mix" of graphics, text, games, and productivity software a home computer would need, but in getting the mix mostly right, the VIC made "personal [computing] become realistic" (Walliser, 2016). Bil [sic] Herd, the principal engineer on several of Commodore's later projects believed that the VIC-20 helped "reshape the meaning of computer user" away from business and education users (Walliser, 2016).

The environment surrounding the VIC team were reported by other computer teams over countless hours in the late '70s and early '80s and viewing them as art houses rather than technology companies help expand our understanding of early consumer-era computer development. Early computer pioneers in similar development shops such as Atari and Apple describe environments that seem more like artists' communes than the stuffy, tie-wearing, cubicle-factories depicted on in media such as Scott Adams' comic strip Dilbert or 1999's Office Space. Atari almost passed on Howard Scott Warshaw, one of its early developers, because he wore a tie to his interview and management was "concerned [he] might be too straight for the environment" (Hill & Warshaw, 2016). At Atari, Warshaw described an atmosphere of "wild and raucous activity" including illicit drug use, liberal alcohol consumption, and office shenanigans described as "the dork version of The Wolf of Wall Street," referencing a movie known for its explicit scenes of debauched excess in Jordan Belfort's infamous New York brokerage house. Atari's management operated on a "hang loose… attitude," which, according to Warshaw was both good and bad, with the latter mostly contributing to poor management decisions which eventually led to the company's downfall. These probably constituted the minority of software houses, the majority of large, established engineering firms were still regimented in the business attire and it took up to a decade to even relax their dress codes (e.g. IBM expected employees to wear full suits, even women, who could wear a tie pantsuit or a "nice dress" with wingtip shoes [Berger, 1995]).

The model of collaboration used to create the VIC, while certainly valuable and successful, has become a multifaceted burden to a large part of the computer industry to this day,

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particularly amongst software engineers. Warning about speedy computer development were sounded as early as the 1960s, and in a recent, scathing editorial written for The Atlantic, Ian Bogost, a professor of interactive computing at Georgia Tech, wrote that "the title 'engineer' is cheapened by the tech industry" as it is an "aspirational title in software development." Bogost recounts a litany of recent software failures, which may have been avoided if software engineers were "regulated, certified, and subject to apprenticeship and continuing education" as traditional engineers are. He and goes one step farther, asserting that "engineering claims an explicit responsibility to public safety and reliability, even if it doesn't always deliver" (Bogost, 2015). Those of similar ken would also find the construction of the VIC a cause for concern since systems more complicated than all but the most basic, particularly those in mission-critical applications, "pose individual and communal dangers that we'd never accept in more concrete structures like bridges, skyscrapers, power plants, and missile-defense systems."

There have been fleeting, but generally unsuccessful attempts to officially counter the type of artful engineering undertaken by the VIC Commandos. In the late 1990s, the state of Texas considered making software engineering a licensed field, but support was spotty and sporadic, and the concept never became more than a recommendation (Bagert, 2002). Texas' work continued on, however, and in 2006, the National Society of Professional Engineers (NSPE, in conjunction with the Texas Board of Professional Engineers [TBPE]) released their *Task Force Report and Recommendation for Computer and Software Engineering Licensure Path,* recommended three steps be taken to promote software engineering as a true engineering discipline: First, that the Society complete and promote their "Computer and Software Engineering Principles & Practice Exam"; second, that they "lobby at least 10 State Licensing Boards to...begin the process of developing a licensure path"; and, finally, that the Society "issue a vote of approval for the finalized Software Engineering licensure path" as was already in developed by the State of Texas (National Society of Professional Engineers, 2006). In 2009, the NSPE and the TBPE joined forced with the IEEE-USA Licensure and Registration Committee, the IEEE Computer Society, and the National Council of Examiners for Engineering and Surveying (NCEES) to form the Software Engineering Consortium, to finalize the exam, and in April 2013, IEEE began to administer it (Kowalenko, 2012). The effects of this exam (if any) on the industry will not be felt until at least half a decade, if not more.

Whatever the future may hold for computers and engineering, the story of the VIC-20 is a small reflection of the heyday of the computer world in the late 1970s early '80s. With its focus on "friendliness," the VIC-20 was one of the first anti-spectatorial, non-esoteric computers by design. No longer the father's apocryphal work-computer he cursed at the dinner table, it was the family's computer that all members could interact with. The chefs of the house could use it to store their recipes, those seeking to play videogames could find them there, the aspiring programmers could learn and create code, the financial managers of the household could balance their checkbooks, and those looking to reach out into one of the first electronic worlds could use its inexpensive modem to interact with those like-minded enough to appreciate new virtual communities. After the VIC, the speed at which the computer market expanded was unlike any other that had come before. Consumers did not purchase computers by the millions until the VIC came along, but after its introduction, this volume became commonplace. The VIC Commandos took to heart Steve Wozniak's belief that "a personal computer should be small, reliable, convenient to use and inexpensive" (Wozniak, 1977) and improved it by making friendly, which, in turn, allowed the VIC to be a democratizing appliance within the home.

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