From Electronic to Video Gaming

(Computing in Canada: Historical Assessment Update)

Sharing the Fun: Video Games in Canada, 1950-2015

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Introduction

Why is the playing of games so important? Even today, the approximately two billion dollars generated in GDP for the Canadian economy by the indigenous video game industry is far outweighed by the $155 billion in annual revenues of the overall information and communications technology (ICT) field. Similarly, while the video game industry may claim about 16,000 employees, the entire ICT sector employs over 520,000 Canadians.[1] Yet, 65 video game and computer science programs have sprung up in Canadian colleges and universities to cater to this new field where 97% of new graduate hires happen within Canada.[2]

Furthermore, electronic gaming has become a pervasive form of entertainment, with 61% of Canadian households reporting by 2012 that they owned at least one game console and about 30% of Canadians playing every single day.[3] With the increasing adoption of mobile platforms (smartphones, tablets) available for use throughout the day, that percentage is expected to rise. Indeed, by 2014, 54% of Canadians had played a computer or video game within the past four weeks.[4] Therefore, paying attention to an industry that is able to capture the attention of so many Canadians on a regular basis is a recognition of its catering to a very deep-seated human instinct, sometimes identified as a neotenous feature rooted in early hominid evolution.

Playfulness has long been recognized as a basic wellspring of human existence. In 1795, as part of a meditation upon esthetics, German thinker Friedrich von Schiller examined the opposition between thought and sensation. He hoped to reconcile two seemingly contradictory aspirations: the valuing of Perfection, absolute rationality and efficiency leading to a fully finished (Platonic) Form, and the valuing of Diversity, of the manifold fruits of boundless creativity escaping from all strictures. In short, Schiller contrasted an urge to seek the abolition of all change through the achievement of a perfect, timeless Form and an opposite urge to seek endless change in the material realm of the senses, or, as he put it, *der Formtrieb* and *der Stofftrieb*. While these two poles may define abstract beauty and blind utilitarianism, both seemed necessary to Schiller in order to guarantee the excellence of human creations. Neither could be left aside. As a happy melding of both, Schiller finally posited a third basic impulse, *der Spieltrieb*, the urge to play. While the sensate instinct wishes to enjoy what it gets to experience, while the formal instinct wishes to finish what needs to come into being, the third instinct is all about openness to novelty instead of beauty where *der Formtrieb* would impose Perfection and all about

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[1] Karna Gupta and Jayson Hilchie, *The Importance of Global Workers in Canada's ICT and Digital Media Industries* (ITAC/ESAC, 2014), p. 1. For the most recent numbers, see: *Essential Facts About the Canadian Video Game Industry 2014* (ESAC, 2015), p. 4.

[2] *Essential Facts About the Canadian Video Game Industry 2014* (ESAC, 2015), p. 7.

[3] *Essential Facts About the Canadian Computer and Video Game Industry 2011* (Entertainment Software Association of Canada, 2011), p. 15; *Essential Facts 2012* (Entertainment Software Association of Canada, 2012), p. 4.

[4] *Essential Facts About the Canadian Video Game Industry 2014* (ESAC, 2015), p. 15.

seeking improvement where *der Stofftrieb* would be happy to receive. Play is a creative freedom that seeks beauty in material things.[5]

By the early 20th century, the great cultural historian Johan Huizinga could assert that the enduring role of play in human cultures showed that humanity might not belong so much to the species *homo sapiens* of "wise humans" as to the species *homo ludens* of humans who play.[6] Starting from more empirical considerations, Cyril Stanley Smith similarly underlined the importance of esthetic and playful pursuits in the story of human achievements, writing in 1968 that "esthetically motivated curiosity, or perhaps just play, seems to have been the most important stimulus to discovery". He noted that the main alloys and metals used until the 19th century had been discovered a millennium at least before the first scientific approach of the problem. Indeed, Smith asserted later that "from the cave paintings on, almost all inorganic materials and treatments of them to modify their structure and properties appear first in decorative objects rather than in tools or weapons necessary for survival".[7] Quite apart from its influence on contemporary society or the Canadian economy, the creativity embodied in modern video games and our interactions with it may turn out to have a long-term significance as far-reaching as that of reading, audiovisual narrative media (film, television) or music within Canada's evolving culture.

The nature of play with electronic toys able to create immersive "microworlds" has questioned observers of video games ever since Sherry Turkle penned *The Second Self* (1984).[8] That same year, Canadian author William Gibson introduced science fiction readers to the concept of cyberspace in his award-winning novel *Neuromancer* and the coincidental echoing of Turkle's "microworlds" clearly reflected the new awareness of one evident power of computer games. The recent success of Ernest Cline's award-winning novel *Ready Player One* (2011), built around the popular culture and electronic games of the 1980s, testifies to their lasting impact on the generation that came of age during that decade. Growing up with the first commercial video games was a new experience that clearly set the stage for widespread acceptance of graphical Web browsers a decade later and the further evolution of video games.

The history of video games in Canada begins in 1950. Given the diversity of hardware supports over that time span and the variety of games themselves, the term must be defined broadly. Video games will include any game that uses electronics, and particularly computers, to enable human interaction with a user interface providing visual feedback. While the use of a video display in the form of a screen defines "video games" in common parlance, other electronic games will be discussed as needed, especially if they were formative in terms of game design or game play, even if they used non-video

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[5] Friedrich von Schiller, *Lettres sur l'Éducation esthétique de l'Homme (Briefe über die ästhetische Erziehung des menschen)* (Paris: Aubier, 1992), pp. 205-225.
[6] Frédérick Maheux and Andréane Morin-Simard, *Les jeux vidéo au cœur de l'art, de la culture et de la société* (Québec: Les Musées de la civilisation, 2014), p. 4.
[7] Cyril Stanley Smith, "Matter versus Materials: A Historical View", *Science*, Number 3584, Volume 162 (1968), pp. 637-644; Cyril Stanley Smith, "Art, Technology, and Science: Notes on Their Historical Interactions", *Technology and Culture*, Volume 11, Number 4 (October 1970), pp. 494-509.
[8] Sherry Turkle, *The Second Self* (Cambridge: The MIT Press, 2005), p. 67.

forms of electronic display such as LED or LCD readouts or if the feedback was provided in the form of onscreen text or Teletype printouts. Almost all platforms used to run video games in Canada will be considered, including mainframes, mini- and micro-computers, arcade machines, handheld games, televisions connected to consoles, tablets, and mobile phones. Electronic and computer games providing non-visual feedback (acoustic and/or haptic) will be considered as well. However, the report will not deal with electromechanical games like pinball and slot machines unless new versions involved a significant electronic and video component.

Typographical note: The names of games designed for electronic instantiation have been italicized (*Pac-Man*), with the exception of early games from the 1960s for which the contemporaneous capitalization of the entire name (ASCOT, CONCORD) was retained. However, for pre-existing games, such as Nim and Tic-tac-toe, the first letter alone is capitalized.

1. Simple Technologies, Simple Games (1950-1975)

This chapter summarizes the evolution of computing and communications technology from the Second World War to the advent of the microprocessor. It covers the prehistory of video games. In the age of vacuum tubes and transistors, computers were either exceedingly expensive or exceedingly simple. As a result, games tended to fall into three categories during most of this time span. On the main, they were either put forward as demonstrations for the masses of the potential of the electronic computer or they were developed with a serious purpose as a training or more broadly educational tool. It may be surmised that in Canada just as in the United States computer games were also created as a form of recreation for the technical elite that enjoyed access to the costly machines needed to run them, but evidence remains scanty on the Canadian side of the border.

1.1 — The Mainframe Era

1.1.1 — Mainframe pioneers

One of the world's first computer games was developed and produced in Toronto by Joseph Kates in collaboration with Rogers Electronic Tubes. Kates then belonged to the electronics team working on the University of Toronto Electronic Computer (UTEC) Mark I. Having designed a binary adder vacuum tube, he helped to build a computer using his "Additron" to play Tic-tac-toe. The resulting machine nicknamed "Bertie the Brain" was displayed at the Canadian National Exhibition (CNE) in 1950.[9] As contemporary pictures and drawings show, the machine was equipped with visual displays.

Kates was born in Vienna in 1921 in a Jewish family, but he fled to Italy and then to England after Nazi Germany's annexation of Austria in 1938. As an enemy alien, he was interned in Great Britain after the Second World War started and then shipped to Canada where he was also interned. When given the chance to write a high school equivalency exam offered by McGill University and thus escape the internment camp, he studied harder than he had ever done in Austria and placed first overall in the province of Québec.[10]

Late that same year of 1950, John Bennett, an Australian employee of the British computer firm Ferranti, designed a computer to play Nim. The new machine was completed by April 1951 and exhibited the following month.[11] Meanwhile, a functional prototype of UTEC was assembled by October 1951.[12] According to Kates, "We also

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[9] Zbigniew Stachniak and Scott Campbell, *Computing in Canada* (Ottawa: Canada Science and Technology Museum, 2009), pp. 15-16. I have found no evidence of an earlier, realized computer game.
[10] Beverley J. Bleackley and Jean LaPrairie, *Entering the Computer Age* (Agincourt: Datacrown/Book Society of Canada, 1982), p. 8; Lisa Queen, "Computer pioneer named to Order of Canada", *North York Mirror* (30 September 2011) [http://www.insidetoronto.com/news-story/69175-computer-pioneer-named-to-order-of-canada/], created 30/09/2011, accessed 28/01/2015; David Thomas, *Knights of the New Technology* (Toronto: Key Porter Books, 1983), pp. 83-84.
[11] Tristan Donovan, *Replay* (Lewes: Yellow Ant, 2010), pp. 5-6.
[12] Stachniak and Campbell, *Computing in Canada*, p. 14.

programmed it for playing games—making it perhaps one of the first computers to be used for that purpose."[13] This would have made it the first general purpose computer to run a game.

In 1952, Alexander Douglas at the University of Cambridge wrote a computer program able to play Tic-tac-toe just as E. F. Moore and Claude Shannon were designing a computer at Bell Labs to play Hex. That same year, Christopher Strachey got a checkers program to run on the Ferranti Mark I computer at Manchester, but he failed to implement it on the Ferranti (Ferut) acquired by the University of Toronto. In 1953, IBM employee Arthur Samuel demonstrated a computer version of checkers in the United States.[14] By 1955, the GENIAC, a computer kit designed by Edmund C. Berkeley and sold as an educational toy, could be programmed to play either Nim or Tic-tac-toe.[15] The following year, a group of Los Alamos programmers completed a modification of the computer MANIAC 1 to play a weak form of chess, which proved to be stronger than the skill mustered by at least one human opponent.[16] In Canada, Frank Anderson, a young University of Toronto student and Canadian chess champion, is remembered for having programmed a computer to play selected end games perfectly, beating over fifty opponents in a row around 1959.[17]

Such games could strain the capabilities of existing computers, but they proved that it was possible both to reduce game play to a series of machine-executed rules and to derive some thrill or pleasure from playing "against" a machine.

1.1.2 — Imitation Games

In 1950, Alan M. Turing suggested that a machine capable of simulating a woman so well as to be taken for one by a male judge could be said to think. The most obvious form of serious computer games during the next decade did turn out to involve simulations, albeit much more rudimentary, with computers used to enhance the game scenarios. By providing rapid or even immediate feedback, either numerical, graphical or textual, the mainframes of the day heightened the realism of the game by performing

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[13] Bleackley and LaPrairie, *Entering the Computer Age*, p. 9. This is not corroborated by Calvin Gotlieb, to the best of his recollection. (Private communication)

[14] Donovan, *Replay*, pp. 5-6; David H. Ahl, "Mainframe Games and Simulations", in *The Video Game Explosion*, Mark J. P. Wolf, ed. (Westport: Greenwood Press, 2008), p. 31; M. Tim Jones, *Artificial Intelligence* (Sudbury: Jones and Bartlett Publishers, 2009), p. 4. Calvin Gotlieb reports that Strachey came to Canada in 1952 for the ACM Conference held when FERUT was finally complete, but that his checkers program failed to work on FERUT. (Private communication). Samuel later noted that his initial program was very close to the one described by Christopher Strachey at the ACM conference in Toronto. See: A. L. Samuel, "Some Studies in Machine Learning Using the Game of Checkers", *IBM Journal of Research and Development*, Vol. 3, Number 3 (1959), p. 208.

[15] Tom Boyko, "Possibly the most…" [http://www.blinkenlights.com/classiccmp/toy/geniac/geniacio.txt], created 30/01/1997, accessed 3/11/2014.

[16] Newell, Allen, J. C. Shaw, and H. A. Simon. "Chess-playing programs and the problem of complexity", *IBM Journal of Research and Development*, Vol. 2, Number 4 (1958), p. 324.

[17] David N. Levy, "Before the Jet Age", in *Computer Games I* (New York: Springer-Verlag, 1988), p. 116. Unfortunately, the code was undocumented. The identity of the computer used by Anderson is uncertain; FERUT left for Ottawa by 1958, so an IBM 650 is the strongest possibility.

computational tasks that humans would have been unable to achieve. In 1961, an early simulation game designer working for Trans-Canada Airlines was clear (and seemingly prescient): "An impression of realism is the most powerful individual factor in achieving the involvement that successful games generate".[18]

In Canada, the Ottawa company ComDev was given a Royal Canadian Navy contract to develop a Tactical Battle Simulator between 1948 and 1956. The stated goal was to train sailors by simulating battles at sea and the resulting machine (using about 8,000 vacuum tubes) reportedly simulated about forty ships and aircraft at a time.[19] While this was not a game as such, the description suggests this was one of the first attempts to convert the classic *kriegspiel* from the 19th century into 20th-century computer wargaming. The earliest noted in the literature is dated to 1952, when the RAND Corporation ran a first test of an air defence simulation in the United States, using data computed by IBM machines.[20] Later, such war games would become as much a staple of military training as a mass market item in the age of video games.

It may not be a coincidence that the first management simulation game to come to the notice of North American executives was also a RAND product, Monopologs, designed to help manage the Air Force supply system, dating from about 1955, but described in successive publications from 1956, 1957, and 1960.[21] It was not computerized, but neither was the original Top Management Decision Simulation developed by the American Management Association (AMA), though it shifted from using desk calculators to an IBM 650 by 1957. Its developers acknowledged the influence of U.S. war gaming.[22] By 1962, the five standard games offered by the AMA all included a computer as a matter of course.[23]

Indeed, in 1962, Imperial Oil was running in Toronto a homegrown computer simulation (ASCOT) to be played for training purposes.[24] Five virtual gas stations were pitted against each other with a custom-built computer allowing for decisions by dial and "master console calculation and display of results", while readout devices provided continuous information in real time (Figure 1.1).[25] A report on ASCOT emphasized that a digital computer might be used, but that, due to the complexity of programming it on

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[18] A. A. Lackman, "Development of a spare parts supply simulation at Trans-Canada Airlines", in *Management Games* (New York: Reinhold Publishing, 1961), p. 276.
[19] Stachniak and Campbell, *Computing in Canada*, p. 19.
[20] F. N. Marzocco, "The Story of SDD", in *Some Documents of Historical Interest: Part of SDC's History, 1950-1957* (RAND U.S. Air Force System Training Project, 1956), p. 1. See also the Hutspiel game run in 1955: Ahl, "Mainframe Games and Simulations", p. 32.
[21] Jean Rehkop Renshaw and Annette Heuston, *The Game Monopologs* (RAND U.S. Air Force Research Memorandum RM-1917-1, 1960), p. v, 3.
[22] Franc M. Ricciardi, "Business War Games for Executives: A New Concept in Management Training", *Fortune*, Vol. 46, Number 5 (May 1957), pp. 45-48.
[23] Paul S. Greenlaw, Lowell W. Herron, and Richard H. Rawdon, *Business Simulation in Industrial and University Education* (Englewood Cliffs: Prentice-Hall, 1962), pp. 275-278.
[24] Peter McRaith and Charles R. Goeldner, "A Survey of Marketing Games", *Journal of Marketing*, Vol. 26, Number 3 (July 1962), p. 71.
[25] Greenlaw, Herron, and Rawdon, *Business Simulation in Industrial and University Education*, pp. 297-298.

very short notice in the midst of game play, either an analogue computer or a combination of analogue and digital computers would serve better instead.[26] The practical challenge is underlined by a 1961 report on a simulation developed by Trans-Canada Airlines: the advantages of computer scoring were admitted, but the company's lone IBM 650 was too heavily subscribed to be relied upon.[27] Yet, by 1962, Trans-Canada Airlines reported using three different simulations, including two fully computerized ones.[28] The speed of this evolution is a harbinger of a decade during which many more computers were bought in Canada as miniaturization (from transistors to integrated circuits, from integrated circuits to microprocessors) allowed more institutions to acquire machines and more people to interact with computers.

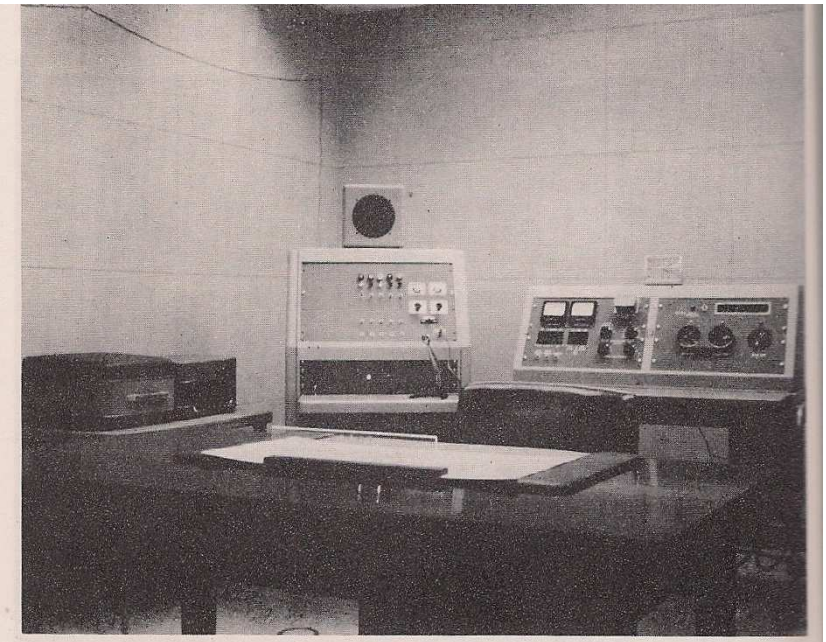

Figure 15–2. General view of ASCOT control center. Tape recorders (right) provide background to make players' private discussions and are available for recording certain data. The communications system (center) contains the signal indicators by which stations may call the umpire who may then speak to them by intercom or make a personal visit if required. The master control (left) is connected with the programming of the game.

Figure 1.1 — Imperial Oil's analogue computer for a service station simulation in Toronto (Kibbee, Craft, and Nanus, 1961, p. 258.)

[26] Patrick J. Robinson, "The Use of Analogue Computers in Operational Games", in *Management Games* (New York: Reinhold Publishing Corporation, 1961), pp. 255-273. ASCOT stood for "Analogue Simulation of Competitive Operational Tactics".

[27] A. A. Lackman, "Development of a Spare Parts Supply Simulation at Trans-Canada Airlines", in *Management Games*, pp. 276-277. Lackman notes that the development of the Canadian game was encouraged by an introduction to Monopologs, which was the only one to simulate "anything resembling an airline environment".

[28] Greenlaw, Herron, and Rawdon, *Business Simulation in Industrial and University Education*, pp. 331-333.

Business simulation games were defined in 1962 as a "sequential decision-making exercise structured around a model of a business operation", which could be devoid of any interaction between competitors (any player's results did not affect any other's) so that competition was reduced to achieving the highest possible score by operating as efficiently as possible.[29] Such a definition underlines that they shared at least one priority with the later games dominated by entertainment value and a purer form of play: a concern for scoring an individual performance. By that date, almost a hundred such games were known worldwide. Almost half (28) of the seventy-four major management games were computerized, and three more were designed to use computers if possible or were being converted to computer use. Out of twenty-one minor games, only six were computerized.[30]

Simulation games for military training had turned into learning tools for private firms and for the business departments of universities. Soon, they caught the attention of other university departments. By the late 1960s, the general availability of computers in universities led to the development of simulations that could be used as educational games, while the National Science Foundation in the United States pushed for the adoption of computers in school and funded the Huntington Computer Project that produced simulation games such as *Malaria* where students had to stem a malaria outbreak.[31] The Vietnam geopolitical simulation jointly developed by the Canadian Peace Research Institute (Clarkson, Ontario) and the Lancaster Peace Research Centre (U.K.) belonged to a slightly different class of learning games even though it combined role-playing humans and computer assistance in a manner reminiscent of ASCOT: while it was intended to be broadly educational, its purpose was more politically pointed.[32]

In Canada, the Ontario Institute for Studies in Education in Toronto had supported by 1969 an investigation of a computer program designed to tutor face-to-face, problem-solving groups. Implemented on a PDP-9, CONCORD used a pure text interface and was tested in game situations both with high-school students and with government administrators.[33]

In 1971, two University of British Columbia researchers reported on a computer simulation of big game populations in British Columbia that they tested on their students for use as a management game. Implemented on an IBM 1130, the simulation's only visual output was in the form of Calcomp plots (Figure 1.2). Like "Bertie the Brain", ASCOT, and CONCORD, it cannot be considered as a video game as such even though visual feedback clearly figures more and more prominently.[34] In 1974, an economics

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[29] Greenlaw, Herron, and Rawdon, *Business Simulation in Industrial and University Education*, p. 5.
[30] Joel M. Kibbee, Clifford J. Craft, and Burt Nanus, eds., *Management Games* (New York: Reinhold Publishing Corporation, 1961), pp. 315-336.
[31] Ahl, "Mainframe Games and Simulations", pp. 33-34.
[32] John Macrae and Paul Smoker. "A Vietnam Simulation: a Report On the Canadian/English Joint Project", *Journal of Peace Research*, Vol. 4, Number 1 (January 1967), pp. 1-24.
[33] Robert Joyner and Kenneth Tunstall. "Computer Augmented Organizational Problem Solving", *Management Science*, Vol. 17, Number 4 (December 1970), pp. B-212, 213, 216, 220, 223.
[34] Carl J. Walter and Fred Bunnell. "A Computer Management Game of Land Use in British Columbia", *The Journal of Wildlife Management*, Vol. 35, Number 4 (October 1971), pp. 644-645, 654-657.

instructor reported using a computer model of the Canadian economy to teach macroeconomics to York University students.[35]

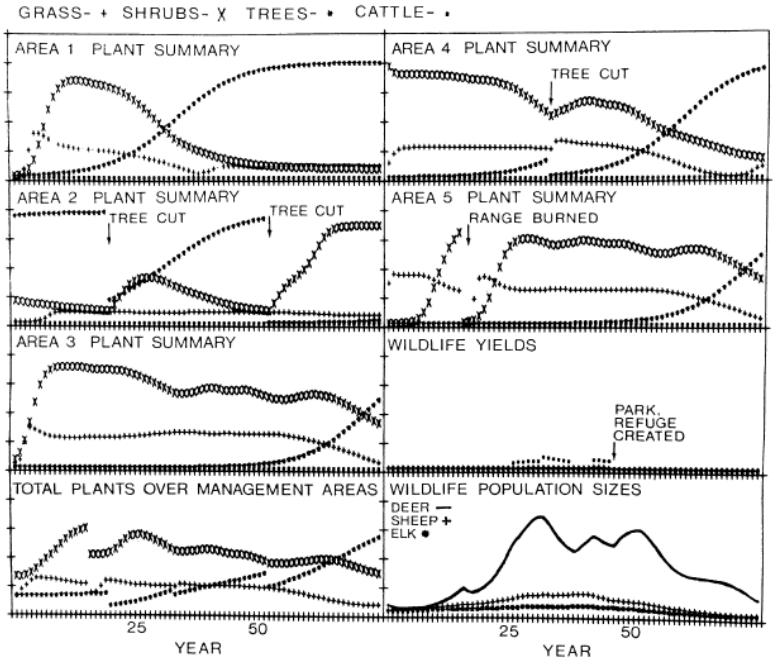

Figure 1.2 — Computer output from a run of the University of British Columbia FARMS management game.

Yet, perhaps the most direct connection between the business simulation games and computer models of the 1960s and the strategy and management video games of the 1990s such as Sid Meier's *Civilization* is provided by a simple text-based computer game created by Canadian engineer Doug Dyment in 1968.[36] Later reworked as a BASIC version (under the name *Hamurabi*) for the books *101 BASIC Computer Games* (1973) and then *BASIC Computer Games* (1978), *The Sumer Game* was presented as "a simulation program/game which will run on a minimal PDP-8 system. The economy of a Sumerian city in the year 3000 B. C. is simulated in the fashion of a modern-day 'business game'."[37] According to Dyment, who was then working for Digital Equipment of Canada (DEC) near Ottawa, he was originally inspired by a graduate student who was pondering the use of an interactive model to teach economics:

"I was out in Alberta, giving a talk at the university in either Edmonton or Calgary (I have forgotten which, though my guess would be Edmonton), and had a post-talk conversation with a graduate student there. She was interested in the idea of teaching

[35] John C. Soper, "Computer-Assisted Instruction in Economics: A Survey", *The Journal of Economic Education*, Vol. 6, Number 1 (Autumn 1974), p. 10.
[36] Neal Roger Tringham, *Science Fiction Video Games* (Boca Raton: CRC Press, 2015), p. 396.
[37] *DECUS Program Library Catalog for PDP-8, FOCAL8* (Maynard: Digital Equipment Computer Users Society, 1973), pp. CI-19, CI-20, 8-43, F-1, F-28. Another Canadian, Dr. A. S. French from the University of Alberta, is credited with recreational software in the same catalogue, ULKA, a kaleidoscope program.

economics by building a model that students could interact with, in order to see the results of economic decisions. It occurred to me that this might be a perfect example for my "large program" project. The final program was literally the largest that could fit in a basic PDP-8; there wasn't room for a single additional character of storage."[38]

While the program harked back to earlier business simulations, it also belonged to the class of simulations that was being developed as actual models (FARMS, for instance) in universities by the turn of the 70s. However, descendants of the *Sumer Game* would be found not only in colleges, but also in high schools and private homes by the end of the 1970s. As such, it derived from the explosion of coding on university campuses during the late 1960s, as the new minicomputers became (relatively) more accessible and computer science students took advantage of available processing time while engaging in an ongoing tug-of-war with administrators who would delete space-wasting games.

1.2 — From Mainframe to Microcomputer

1.2.1 — Games and Computers in Canada

Computer games followed several different lines of evolution during the 1960s. Simulation games and models continued to absorb the efforts of programmers in the business world and academic faculties. Artificial intelligence researchers developed programs to allow a computer to play such games as chess in order to elucidate the nature of intelligence. Professional programmers might develop recreational programs as an exercise, while students on college campuses often enjoyed sufficient access to early computers (before the tighter security inspired by student protests) to develop text-based games. All of these are known to have taken place in the United States, but only the production of models and simulation games is recorded in Canada, though further research may reveal parallel activities.

Academic arguments in this field centered not on the feasibility of programming a computer to play, but on the meaning of such achievements. In 1960, Wiener referenced the IBM computers capable of playing a mean game of checkers while the results of chess-playing programs were less convincing.[39] The achievements of programmers did not necessarily disarm Wiener's critics. In 1960, Mortimer Taube responded to Wiener's description of machines able to play checkers or chess by asserting: "Actually, no such machines exist." Taube went on to explain that while machines might be able to calculate moves according to encoded rules, they could not actually *play* insofar as they would lack any grasp of the goal of the given game: "If game is used in the usual sense—that is, as it was used before the word was redefined by computer enthusiasts with nothing more serious to do—it is possible to state categorically that machines cannot *play* games."[40] While this philosophical argument will presumably remain valid until

[38] Doug Dyment, 2015. (Private communication)
[39] Norbert Wiener, Norbert. "Some Moral and Technical Consequences of Automation", *Science*, Vol. 131, Number 3410 (6 May 1960), pp. 1355-1357.
[40] Mortimer Taube, "Computers and Game-Playing", *Science*, Vol. 132, Number 3426 (26 August 1960), pp. 555, 557.

machines acquire the combination of intelligence and consciousness required to play according to Taube's definition, millions of gamers have accepted the illusion of play since then, though it might be argued whether they are playing *with* a machine, *against* a machine or have turned into Taubian machines themselves insofar as videogame play often involves following the rules set by the developers. In fact, O'Donnell identifies another component to modern game play: the desire of game developers "to understand how games tick, how hardware functions, and how to leverage software systems to produce" interesting creations.[41] What could not be glimpsed in 1960 is that computer play would come to include, at its deepest level, a deconstruction of the game itself.

In Canada, the arguments of Wiener and Taube were further explored in a 1974 paper by a Dalhousie University researcher who investigated pattern recognition in computers and humans, as applied to the case of chess in particular. The author cautioned that similar levels of performance would not mean that computers would be matching human capabilities if programs were using different strategies to achieve the same results. Identification had to be distinguished from recognition.[42] However, high-achieving chess programs were still far in the future.

One manual of the PDP-8 provides a listing of games that reflects more accurately the available recreational software by the end of the 1960s. In addition to *The Sumer Game*, these included Tic-tac-toe, Blackjack, kaleidoscope programs, chess, roulette games, Nim, the Towers of Hanoi, a computer dating game, a science-fiction quiz, a version of Monopoly, Hangman, checkers, a lunar landing simulation, *Space War*, and a golf program, among others.[43] While these might have been only skill-testing exercises in the beginning, several of these would prove to be the predecessors of the modern video game industry in the United States.

Such games were undoubtedly known to Canadian programmers, who sometimes contributed to the accumulating store of similar programs, as in the case of Dyment. Yet, in Canada, they remained mere diversions, perhaps as a result of the specific structure of the country's industry.

The Canadian computer sector developed between the 1950s and the 1970s as a result of three main sources of impetus. Academic research, as at the University of Toronto, either investigated new computing designs or relied on computers to perform research in a number of calculation-intensive and data-intensive fields. Within Canada's federal government, the military and some associated departments, such as Atomic Energy of Canada Ltd (AECL), contracted with Canadian companies to develop or procure various computing resources. Finally, private companies offered made-in-Canada computing services (accounting, payroll). There were few manufacturers of actual machines; most

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[41] Casey O'Donnell, *Developer's Dilemma: The Secret World of Videogame Creators* (Cambridge: The MIT Press, 2014), p. 27.
[42] Roland Puccetti, "Pattern Recognition in Computers and the Human Brain: With Special Application to Chess Playing Machines", *British Journal for the Philosophy of Science*, Vol. 25 (1974), pp. 140-141, 144-146.
[43] *DECUS Program Library Catalog for PDP-8, FOCAL8*, pp. CI-19, CI-20.

computers sold during this time were made abroad and sold by Canadian subsidiaries or agents for such U.S. companies as IBM, the so-called "seven dwarfs" (Univac, Honeywell, Burroughs, RCA, General Electric, Control Data Corporation, and NCR), Bendix, Librascope, and Alwac Corporation. With the invention of the transistor, the integrated circuit, and the microprocessor, computer systems did become smaller and cheaper, which made it easier for Canadian companies to enter the field or U.S. companies to try manufacturing minicomputers in Canada, such as Digital Equipment Corporation (DEC) and Data General in the 1960s. However, most Canadian sales continued to depend on U.S.-made equipment for the most part.[44]

The absence of a strong domestic computing equipment manufacturing sector may explain Canada's absence from the early development of video games. More people became familiar with computers in the United States since they encountered them in educational settings, in the context of their design and manufacture, or in the places they were actually used. There were fewer occasions to do so in Canada. Besides sheer availability, there was also an automatic time lag between a model's appearance in the United States and its export to Canada.

Technologically speaking, the 1960s witnessed a breakneck rate of hardware innovations. While solid-state transistors were state of the art at the outset, integrated circuits were developed soon after and, by the end of the decade, Steve Geller and Ray Holt had developed the first microprocessor for the U.S. Navy. A head start of even a few months could be the difference between working with the newest machine and struggling with one that was fated to end up on the scrap heap.

Furthermore, the computing services sector in Canada catered either to corporate customers or to institutional customers. Existing companies during this period did not target individual consumers. While this was also true in the United States, there was perhaps greater openness to the possibility of seeking new markets, especially on the part of start-ups.

1.2.2 — The First Canadian Microcomputers

The invention of integrated circuits and of the microprocessor brought down the cost of information processing to the point where it became possible to build affordable computers for the layperson. In 1968, federal government support led to the transformation of Northern Electric's research and development centre in Ottawa into the nucleus of a new company, Microsystems International Ltd. (MIL), headquartered in Montreal. Through a partnership with Intel, MIL gained access to semiconductor and microprocessor technology, which allowed it to launch three microcomputers in the early 1970s. Whereas the CPS/1 system (1972-1973) did not enjoy notable success, the more powerful MOD8 and MOD80 produced in 1974-1975 became not only development tools for systems engineers but also prized acquisitions by North American computer

[44] Bleackley and LaPrairie, *Entering the Computing Age*, pp. 26-33, 40-50, 61-82, 114; Stachniak and Campbell, *Computing in Canada*, p. 29. One short-lived exception was the Ferranti-Packard FP-6000, designed and made in Canada, *ca*. 1962-1964.

hobbyists.[45] Indeed, they proved to be of particular interest to the Toronto Region Association of Computer Enthusiasts (TRACE), founded in 1976.[46]

Canadian hobbyists could also take advantage of another Canadian microcomputer, the MCM/70 produced by Micro Computer Machines, whose company headquarters were found on the outskirts of Toronto. Designed in 1973 as a machine for individual users in various fields, the MCM/70 used an Intel 8008 and had its commercial launch in 1974.[47] It offered by July 1973 a fun and games library.[48]

Two TRACE hobbyists, Canadian-born Jim Butterfield (1936-2007) and British-born Peter R. Jennings, went on to create numerous games for the first microcomputers. In 1976, Jennings created *Microchess* for the KIM-1 microcomputer from U.S. company MOS Technology (acquired that same year by Commodore).[49] In his own 1977 guide to the KIM-1, Butterfield included games he had written, including mostly text-based versions of Blackjack, Craps, Nim, and Ping-pong, as well as the games *Farmer Brown* and *Multi-Maze* featuring minimal ASCII art.[50]

1.3 — The Origins of Electronic Video Games

1.3.1 — The Appeal of Television

By the end of the 1950s, television sets were present in approximately 90% of the homes in Canada and the United States. This made them a much more convenient medium for video than the much rarer and more expensive computers of the same vintage. Yet, while the use of a television screen for a simple electronic game was patented in 1947 and U.S. engineer Ralph Baer (1922-2014) was struck in 1951 with the potential of generating artificial patterns or images for the screen, it was not until 1958 that William Higinbotham and Robert V. Dvorak coupled a small analogue computer with an oscilloscope to create the first true video game, *Tennis for Two*. For two or three years, visitors at the annual open house of the Brookhaven National Laboratory were able to move rackets and hit the ball, all of them shown on the tiny five-inch phosphor screen.[51] The combination of computer and monitor heralded new possibilities, just like the marketing in 1959 of the Digital Equipment Corporation PDP-1 with a fifteen-inch video display.[52] However, the first stab at a commercial video game had to wait until 1966 when U.S. engineer Ralph Baer come up with the idea for a cheap set of electronics that

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[45] Stachniak and Campbell, *Computing in Canada*, pp. 50-51.
[46] Dov Lungu and Zbigniew Stachniak, "Following TRACE: The Computer Hobby Movement in Canada", *Scientia Canadensis*, Vol. 34, Number 1 (2011), pp. 2, 7-9. By July 1976, TRACE members had put together thirteen MOD8 or MOD80 microcomputers.
[47] Campbell and Stachniak, *Computing in Canada*, pp. 51-52.
[48] "The MCM Collection", York University Computer Museum [http://www.cse.yorku.ca/museum/collections/MCM/MCM.htm], accessed 9/02/2015.
[49] Lungu and Stachniak, "Following TRACE: The Computer Hobby Movement in Canada", p. 13.
[50] Jim Butterfield, *The Book of Kim* (1977) [http://users.telenet.be/kim1-6502/6502/fbok.html], accessed 9/02/2015.
[51] Donovan, *Replay*, pp. 7-9.
[52] Ahl, "Mainframe Games and Simulations", p. 33.

would plug into a television in order to transform it into a video game terminal. By 1967, his team had produced the first video game console, then called the Brown Box, along with several different games, including a version of Ping-pong and a shooting game.[53]

Baer worked for Sanders Associates, a military contractor that sought to interest a couple of television companies before striking a deal with Magnavox. The system called Odyssey was test-marketed in 1971 and released in 1972. It did not include integrated circuits or a microprocessor as each separate game card or cartridge physically connected the required console circuits. The monochrome graphics were extremely basic, often no more than lines or squares.[54] The system was packaged with ten to twelve games (the former for the European market, the latter for the U.S.) and it grew increasingly popular as Atari's arcade PONG became a sensation because the Odyssey was the only way of playing an electronic Ping-pong game at home. By 1974, Atari decided to develop a home-version of its arcade game and developed a system using integrated circuits that offered colour graphics, higher resolution, and score-keeping. A deal with Sears allowed Atari to launch in 1975 the era of home video games using computerized consoles. Sales were good in spite of the competition of two new game consoles from Magnavox that used custom-designed Texas Instruments chips though the quality of the graphics remained poor.[55] That same year, the U.S. company Dave Nutting Associates outdid them both by designing *Gun Fight* as an arcade game using a leading edge 8080 microprocessor from Intel.[56]

No such developments are known in Canada. The popularity of the original Magnavox Odyssey was limited by the need to enhance graphics with awkward sheets of plastics placed over the television screen. However, by the summer of 1976 the new generation of television games would take the Canadian market by storm, with department stores selling out and new competitors like Coleco finding that the games sold particularly well in remote parts of the country with a need for more leisure options. According to Brian Clarke of Coleco, his Telstar console was "selling like crazy in places like Tuktoyaktuk and Happy Valley, Labrador."[57] In short, video games only started to sweep the market once the television was wedded to the computer and started benefiting from Moore's Law.

1.3.2 — The First Electronic Video Games

In 1961-1962, a group of MIT students led by Steve Russell designed a game called *Spacewar!* for a new PDP-1 computer. Opposing spaceships dueled in a physically

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[53] Donovan, *Replay*, pp. 11-13.
[54] David Winter, "System Profile: The Magnavox Odyssey", in *The Video Game Explosion: A History from PONG to Playstation® and Beyond* (Westport: Greenwood Press, 2008), p. 50.
[55] Leonard Herman, "Early Home Video Game Systems", in *The Video Game Explosion: A History from PONG to Playstation® and Beyond* (Westport: Greenwood Press, 2008), pp. 54-55; David Winter, "Video Games in Europe: The Early Years", in *The Video Game Explosion: A History from PONG to Playstation® and Beyond* (Westport: Greenwood Press, 2008), pp. 45-46.
[56] Donovan, *Replay*, pp. 41-42.
[57] Ellen Roseman, "A Telstar in every home?: Computerized TV games newest fad", *The Globe and Mail* (21 August 1976), p. 4.

realistic version of outer space. The game proved sufficiently popular to be copied, modified, and adapted for other machines. Furthermore, it inspired the first coin-operated video game, *Galaxy Game*, offered to students at Stanford University in September 1971. It used a cheaper and more powerful PDP-11 computer, but it was an unprofitable one-off. Another game inspired by *Spacewar!* was less faithful to its intricacies, but more profitable. Known as *Computer Space*, it was offered as an arcade game by Nutting Associates starting in November 1971. The next year, the creator of *Computer Space*, Nolan Bushnell, felt confident enough to strike out on his own. He co-founded Atari and launched a new arcade game, *Pong*, inspired by the Odyssey game. Within the relatively small amusement machine business of the time, it was a hit and it was replicated in other countries, including Japan, France, and Italy. By 1974, there were 100,000 coin-operated video games in the United States alone.[58]

As early as 1973, California-based Ramtek established an affiliate in Montréal, Volly Industries, to manufacture Canadian models of its arcade games.[59] The company was dissolved by the federal government in 1980. No homegrown manufacturer of original arcade video games is known at this point, however.

1.4 — Conclusions

As with other technological inventions, the lack of vision of early pioneers is easy to mock. In the case of computer games, it is epitomized by an inability to understand their potential, as revealed by the MIT students who decided against trying to commercialize *Spacewar!* As in other cases, mockery ignores the context. Given the $120,000 cost of the PDP-1 used by Russell and his friends, it would have been foolish to expect to make any money from the game.[60] Financial and material constraints similarly hindered the development of games in Canada.

Early computer development was centered inside the Toronto-Ottawa-Montreal triangle. Universities, banks, other financial institutions, head offices, and many government agencies were based in or around the three cities. During this period, such large organizations were the main customers for the new and expensive computers of the day. The "branch plant" model that dominated Canada's economy had a two-edged effect. On the one hand, Canadian branches might be pushed by their U.S. owners to acquire computers. On the other hand, computer acquisitions were often decided in the U.S. and benefited U.S. manufacturers accordingly. By the 1970s, the Canadian computer service industry would boast the highest levels of domestic ownership, while the computer equipment sector largely remained under foreign control.[61] Abortive attempts to launch Canadian-made microcomputers in the 1970s did nurture a community of computer enthusiasts who numbered among the first developers of computer games in Canada.

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[58] Donovan, *Replay*, pp. 9-27.
[59] Sylvain De Chantal, "Volly Industries Ltd. – The 1st Arcade Manufacturer in Canada!" [http://www.ccjvq.com/slydc/topic/volly/volly.htm], accessed 9/02/2015.
[60] Donovan, *Replay*, p. 11.
[61] Bleackley and LaPrairie, *Entering the Computer Age*, pp. 26, 31.

Can the early start of computer science within Canadian universities explain, on the other hand, the success over the long run of game development in Canada? While the level of expertise fostered by the computing work at the University of Toronto cannot be underestimated, it does not necessarily compare with the massive effect of the arrival of personal computers in tens of thousands of homes across Canada by the early 1980s.

During the 1970s, however, there is little evidence for the evidence of anything but the simplest computer games in Canada. The main breakthroughs took place in the United States. With games available on computers, consoles linked to televisions, and dedicated coin-operated machines, the lineaments of the modern "video games" industry could already be discerned, though the term itself would only gain sway in the late 1970s.

2. The First Boom of Arcade and Computer Games (1975-1988)

This chapter explores the pioneer phase of video game history. For the first time, entertainment software could be delivered to players in several different forms. Arcade machines, game consoles for use with televisions, computers, handheld devices, and even early networks all contributed to bring video games to the North American public. One consequence of the craze for video games was the first public panic associated with video games. Stimulated by an unfortunate pronouncement from the U.S. Surgeon General in 1982, it built on the disreputable allure of the games arcade in popular culture, going back to their pre-video games, post-World War II mob associations in the U.S., and dovetailed with the backlash against recreational drug use in order to present gamers as addicts.[62] While the bursting of the early-1980s gaming bubble soothed those worries, software games did not disappear and the demonstrated gap in Canada's intellectual property legislation was filled at the behest of the computer industry, among others, by a tightening of the Copyright Act to restrict what could be done with commercial software products.

2.1 — Arcade Fever

2.1.1 — The Canadian Context

While pinball arcades belonged to the seamy side of life in the United States and were widely suspected of mafia associations, they benefited from the diversity of state laws that governed gambling and faced less interference in some cases than arcades in Canada. Canadian federal legislation outlawed paying games that involved more chance than skill. While enforcement was spotty, the existence of game arcades was uneasy at best.[63] As a result, they were often relegated to local equivalents of Toronto's "sin strip", described in 1975 as bringing into close proximity "body-rub parlors, a fun 'n games arcade, burlesque houses and the Pulsation Theatre, boasting the 'best uncensored sex films and stag movies'."[64]

Thus, Peter Budd, the owner of four Toronto arcades with 150 pinball machines, could be shut down on 24 hours' notice by two officers from the morality squad in 1975. Budd protested that the classic pinball machine was less subject to chance than the new electronic games: "So you take a pinball machine and you take one of those 25-cent videogames and for your quarter on the video you get one minute whether you're good, bad or indifferent. But you can play half an hour on the pinball if you got skill."[65]

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[62] Donovan, *Replay*, pp. 95-96 ; Turkle, *The Second Self*, pp. 67-69; Olivier Mauco and Thomas Gaon, "Des Jeux vidéo addictifs et violents ?", in *La Fabrique des jeux vidéo*, Olivier Lejade and Mathieu Triclot, eds. (Paris: La Martinière, 2013), pp. 118-123.

[63] Ann Bayin, "Backstage at the Midway", *The Globe and Mail* (27 August 1977), p. A8.

[64] Aubrey Wice, "The Jesus message on the sin strip", *The Globe and Mail* (8 February 1975), p. 54.

[65] John Marshall, John. "Games king can no longer offer pinball", *The Globe and Mail* (30 January 1975), p. 5. Budd would later run in 1976 as a candidate in Toronto's Ward 6 in the 1976 civic elections and chair the Metro Amusement Association, a local lobby group for arcade operators. One of his main backers was Pasquale Giordano, who showered local politicians and police with largesse before his arrest in 1977. See:

Budd's appraisal would later be reversed completely, but the more widely his opinion was shared, the more likely Canadian arcade operators would have thought twice before risking the unofficial tolerance of the authorities by investing in the new technology from Atari, Allied Leisure or another foreign video game company.

By July 1975, however, the Liberal government of Pierre Trudeau introduced Bill C-71, the Criminal Law Amendment Act.[66] Among its many provisions was an exemption for coin-operated machines that only paid in free games from the law restricting slot machines.[67] Media coverage interpreted this only in terms of pinball machines, however, revealing perhaps a low level of awareness of the arcade video game explosion in the U.S.[68]

The bill received Royal Assent on 30 March 1976. By 1974, coin-operated video games were generating revenues on the order of $250 million in the United States.[69] Canada was potentially a major new market for the U.S. industry. However, the city of Montreal, for one, passed in September 1977 a by-law to restrict the spread of pinball parlours and other amusement halls that might host arcade video: the number of machines in existing establishments could not be increased, amusement halls could not be opened within the historical downtown district or within 200 metres of a school, college or public park, and minors were barred from all such establishments. The by-law would not be struck down by the Supreme Court until 1985.[70]

In short, the hostility of Canadian authorities to pinball parlours and arcade video games only abated slowly. Outside companies did try setting up directly in Canada, but few stayed long. For instance, Atari incorporated Atari (Canada) in April 1974 before announcing in December 1975 its intention to surrender its charter.[71] As for Volly Industries, it was no longer listed at its corporate address in the 1978-1979 edition of Montréal's Lovell directory.

2.1.1 — From the Arcade to the Christmas Tree

Therefore, while video games were already known in Canadian arcades by 1976, their adoption was more easily accomplished through the marketing of home consoles and the further development of computer games. During the 1976 summer, the brisk (and

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Peter Moon and Stan Oziewicz, "Police, politicians drawn into orbit of strip operator", *The Globe and Mail* (11 August 1977), pp. 1, 5.

[66] *House of Commons Debates. Official Report. First Session—Thirtieth Parliament.* Vol. IX. Ottawa: Queen's Printer for Canada, 1975, pp. 9203-9211;

[67] "Montréal v. Arcade Amusements Inc.", *Supreme Court Judgments. [1985] 1 SCR 368* (24 April 1985), p. 420.

[68] "Bill would overhaul many laws", *The Globe and Mail* (18 July 1975), p. 23.

[69] Donovan, *Replay*, p. 26.

[70] "Montréal v. Arcade Amusements Inc.", *Supreme Court Judgments* (24 April 1985), pp. 368, 372-374.

[71] Since Warner only bought Atari in October 1976, it is unlikely this decision was part of Atari's decision to sell. Atari (Canada) was dissolved in April 1977. See: Donovan, Replay, pp. 67-68; "Legal", *The Globe and Mail* (7 January 1976), p. 40.

unseasonal) sales in Toronto of video games to be hooked up to televisions at home—also termed "cybersports"—began to garner media notice.[72] About $15-million worth of video games were sold for Christmas, but the appeal of the simple ball-and-paddle soon paled for many buyers.[73] Parental enthusiasm may have also been dampened by an announcement from the Department of Consumer and Corporate Affairs in February 1977 that prolonged playing of video games might cause persistent outlines to remain visible when the television was switched to regular viewing.[74]

By the Christmas of 1977, Atari attempted to rekindle the buying fever by introducing video game cartridges, while other companies tried to compete on price. High returns after the 1976 Christmas had doomed all but a dozen out of about 65 North American video game companies in existence the previous year, including Unitrex of Canada, a Toronto-based distributor of Japanese video games. Though it was only the third year that video games had been marketed in Canada, *The Globe and Mail* noted the offering of the Coleco Telstar Arcade, a video game designed in the United States but made in Canada, and of the Sears Speedway (Figure 2.1), claimed to be Canadian on the grounds that it was manufactured by Electrohome in Kitchener (though it was in fact an Atari design).[75]

Figure 2.1 — The Sears Tele-Games Speedway sold in Canada

In Montréal, Atari and Coleco battled it out in 1977, with the Coleco Telstar Arcade offering the possibility of shooting at the television screen with a light-sensitive pistol.[76] By 1978, the novelty had worn off: *The Globe and Mail* merely noted in passing that

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[72] Roseman, "A Telstar in every home?", p. 4.
[73] Roseman, "Video games are back with new wrinkle", *The Globe and Mail* (26 November 1977), p. 4.
[74] "Possible problems with video games", *The Val d'Or Star* (23 February 1977), p. 11.
[75] Roseman, "Video games are back with new wrinkle", p. 4. Electronic pinball machines for the home made by Bally in Chicago and distributed in Canada by Paragon Entertainment Products of Montreal were also on offer for Christmas. See: Ellen Roseman, "Will Santa bring a pinball machine?", The Globe and Mail (26 November 1977), p. 1.
[76] Nancy Durnford, "Tuning into video games: What to buy and how to protect your TV set", *The Montreal Gazette* (3 December 1977), p. 47.

Eaton's "video games that cost about $300 are just as popular as last year".[77] The acclimatization of video games was complete: in April 1978, the Western premiers published a report highlighting the intention of the federal Department of Communications to set standard for home video games as a federal infringement of provincial jurisdiction over consumer protection issues.[78]

By 1979, as Ellen Roseman of the *Globe and Mail* surveyed the assortment of electronic goods on offer for Christmas, ranging from video games to home computers and electronic toys such as Merlin and Simon, she opted for a new angle and concluded her piece as a modern skeptic: "Playing games with a computer seems like a rather lonely pursuit, a strange new way of socializing. Give me a real game with real people any day. I'm tired of being a technology groupie."[79] Technological pessimism did not prevail in the short run, but her pronouncement heralded a backlash to come even as sales continued to mount.

2.2 — Canadian Initiatives

While imported video games flooded Canadian homes, few home-grown companies attempted to grab a share of the market. The government's attention was focused on the development of videotex and most Canadian entrepreneurs, like Paragon Entertainment or Unitrex, eyed the opportunities of distribution, not head-on competition with foreign companies. Nor did the academic sector explore the use or improvement of video games, though University of Waterloo computer scientist J. Wesley Graham pioneered in 1979 the use of computers to score water ski tournaments and more generally to enhance the sports experience.[80] As for mathematician A. K. Dewdney at the Universe of Western Ontario, who wrote on computer recreations in *Scientific American* magazine, his most famous game creation came late in this period, in the form of the basic though brutally clever *Core War* (1984).[81] However, educational software was increasingly produced in Canada in the form of games for schools and younger users. It was left to a new generation of home users and hobbyists to author original video games as home computers freed them from the constraints associated with computers in schools and colleges.

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[77] Peggy McCallum, "Kookier the Better: Gnomes for adults, dog T-shirts are big sellers this Christmas", *The Globe and Mail* (9 December 1978), p. 1.
[78] William Johnson, "View from Quebec: Provincial grumbles are becoming louder", *The Globe and Mail* (19 June 1978), p. 8.
[79] Ellen Roseman, "Electronic games more fun for designers than for kids", *The Globe and Mail* (20 December 1979), p. T1.
[80] "James Wesley Graham, O.C.", [http://csg.uwaterloo.ca/~jwgraham/jwgoc.html], accessed 28/01/2015; "J. Wesley Graham fonds. Finding Aid: GA 133", University of Waterloo Library, pp. 4, 11, 13-15, 19, 30-36 [https://uwaterloo.ca/library/special-collections-archives/sites/ca.library.special-collections-archives/files/uploads/files/ga133.pdf], accessed 28/01/2015; "J. Wesley Graham fonds: accrual 2003: WATFAC files. Finding Aid: GA 144", University of Waterloo Library, p. 12 [https://uwaterloo.ca/library/special-collections-archives/sites/ca.library.special-collections-archives/files/uploads/files/ga144.pdf], accessed 28/01/2015.
[81] Alexander K. Dewdney, "Computer Recreations: In the game called Core War hostile programs engage in a battle of bits", *Scientific American*, Vol. 250, Number 5 (May 1984), pp. 14, 18-20, 22.

2.2.1 — The Commodore Case

The Commodore personal computers were among the most popular platforms for computer and video games during this period. The Commodore PET, Commodore VIC-20, Commodore 64, and Commodore Amiga sold millions of units. Games were a mainstay of many Commodore machines, with the VIC-20 (Figure 2.2), Commodore 64, and Commodore Amiga stimulating the creation of many more games once they were on the market. Indeed, the market success of the Commodore 64, which drove Texas Instruments out of the home computer business, also ate into the sales of game consoles.[82]

Therefore, determining whether Commodore computers can be considered part of the Canadian history of technology will also affect the shape of the history of Canadian video games. Whether they can be identified as Canadian is an issue complicated by the conflicting results of assessing the company's ownership, control, leadership, creation, and production, which all varied over time. Sources are incomplete and contradictory.

The company's founder, Jack Tramiel (originally Idek Tramielski or Jacek Trzmiel), was a Polish-born Holocaust survivor who emigrated to the U.S. and joined the army, where he eventually worked on the maintenance and repair of office equipment between tours in Korea. After leaving the army, he drove a taxi in New York, before starting a business repairing and reconditioning typewriters. He moved to Toronto around 1954 to sell reconditioned typewriters sourced in New York and then formed in 1958 the Commodore Portable Typewriter Company to sell cheap portable typewriters made with Czechoslovakian parts. The need for financing led to the creation of a New York State subsidiary company in 1960, a public issue of shares in 1962 in Montréal and New York, Tramiel's embroilment in the Atlantic Acceptance scandal of 1965, and the rescue of the renamed Commodore Business Machines by Toronto investor Irving Gould who, in exchange for a cash infusion, acquired the largest share of ownership and became chairman of the board.[83]

There is no evidence that Tramiel acquired Canadian citizenship after his move to Toronto since he was reportedly still seeking to acquire Canadian citizenship in 1980.[84]

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[82] Donovan, *Replay*, pp. 102-103.

[83] Brian Bagnall, *Commodore: A Company on the Edge* (Winnipeg: Variant Press, 2010), p. xiii; Mark Hachman, "Report: Jack Tramiel, Founder of Commodore, Dead at 83", *PC Mag* [http://www.pcmag.com/article2/0,2817,2402785,00.asp], created 9/04/2012, accessed 10/02/2015; Samuel H. S. Hughes, *Report of the Royal Commission Appointed to Inquire into the Failure of Atlantic Acceptance Corporation Limited*, vol. 3 (12 September 1969), pp. 1594-1595; Ian Matthews, "Jack Tramiel — King of the Home Computer", *Commodore Computers* [http://www.commodore.ca/commodore-history/jack-tramiel-king-of-the-home-computer/], created 12/04/2006, accessed 10/02/2015.

[84] Bagnall, *Commodore*, p. 291. Tramiel originally chose to try his luck in Toronto because his wife had relatives there. See: Hughes, *Report of the Royal Commission Appointed to Inquire into the Failure of Atlantic Acceptance Corporation Limited*, p. 1594; "You Don't Know Jack!", *Commodore Computers* [http://www.commodore.ca/commodore-history/you-dont-know-jack/], first published in 1989, accessed 10/02/2015.

However, Gould was a Canadian citizen who remained one till the end of his life. Crucially, he moved the firm into adding machines, and then into the assembly and very profitable sale of electronic calculators, especially in European markets.[85] By 1975, however, Commodore lost money as a result of competition from Japanese manufacturers and Texas Instruments. When Commodore decided to buy in 1976 a U.S. maker of microprocessors, MOS Technology, Gould guaranteed a loan for US$3 million.[86] The transaction turned Commodore into a computer maker as MOS Technology had developed a small home computer, the KIM-1, as a demonstrator for its new chip. Commodore's new chief engineer, Chuck Peddle, whose grandfather was originally from Newfoundland, went on to develop the Commodore PET.[87]

Just as it prepared to launch the Commodore PET 2001 in 1977, the company was reorganized in 1976 to move its financial headquarters (Commodore International Limited) to the Bahamas. It had by then divisions in Canada, the United States, Germany, Switzerland, Japan, Hong Kong, and the United Kingdom.[88] The next ten years launched the home computer industry and Commodore was a key player under the leadership of Tramiel. However, Tramiel left the company in 1984 and Irving took on a more active management role until the final bankruptcy of Commodore in 1994.[89]

In short, Tramiel dominated the running of the company from 1958 to 1984, but Gould chaired it from 1966 to 1994. However, Commodore was only a computer company as such between 1976 and 1994. While it could be said that Tramiel built it into a billion-dollar company in eight years and that Gould destroyed it in ten, it may be argued that Commodore would never even have existed without Gould's financial aid in times of need.

Most of Commodore's computer technology originated in the United States, with significant contributions from the company's Japanese division and minor contributions from Canada, especially through its partnership with the University of Waterloo.[90] As for production, the original metal housing of the Commodore PET was manufactured by a division of Commodore in Toronto, Nortex Products.[91] In 1983, Commodore still produced office furniture as well metal housings for its CBM 8032 and SuperPET computers at its plant in Scarborough.[92] By 1983, Commodore's Canadian factories

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[85] Ian Matthews, "Irving Gould — The Money Man", *Commodore Computers* [http://www.commodore.ca/commodore-history/irving-gould-the-money-man/], created 30/09/2002, accessed 10/02/2015; Bagnall, *Commodore*, pp. xiii, 65.
[86] Matthews, "Irving Gould — The Money Man", [http://www.commodore.ca/commodore-history/irving-gould-the-money-man/]. Gould's backing of a crucial loan is not mentioned by Bagnall, whose account of the acquisition focuses on Tramiel's sharp dealing. See: Bagnall, *Commodore*, pp. 55-59.
[87] Bagnall, *Commodore*, pp. 1-2.
[88] Bagnall, *Commodore*, p. 65.
[89] Bagnall, *Commodore*, pp. 529-533; Matthews, "Irving Gould — The Money Man", [http://www.commodore.ca/commodore-history/irving-gould-the-money-man/].
[90] Bagnall, *Commodore*, p. 414; Stachniak and Campbell, *Computing in Canada*, pp. 53-54.
[91] Bagnall, Commodore, pp. 105-106. The Commodore PET casing material was later switched to plastic.
[92] "Commodore Quarter Century: From Retail Shop to Global Giant — 1983", *Commodore Computers* [http://www.commodore.ca/commodore-history/commodore-quarter-century-from-retail-shop-to-global-giant-1983/], first published 11/1983, created 15/03/2003, accessed 10/02/2015.

(including one in Agincourt) had manufactured 300,000 units of the VIC-20, with 80% of these being sold to Canada.[93]

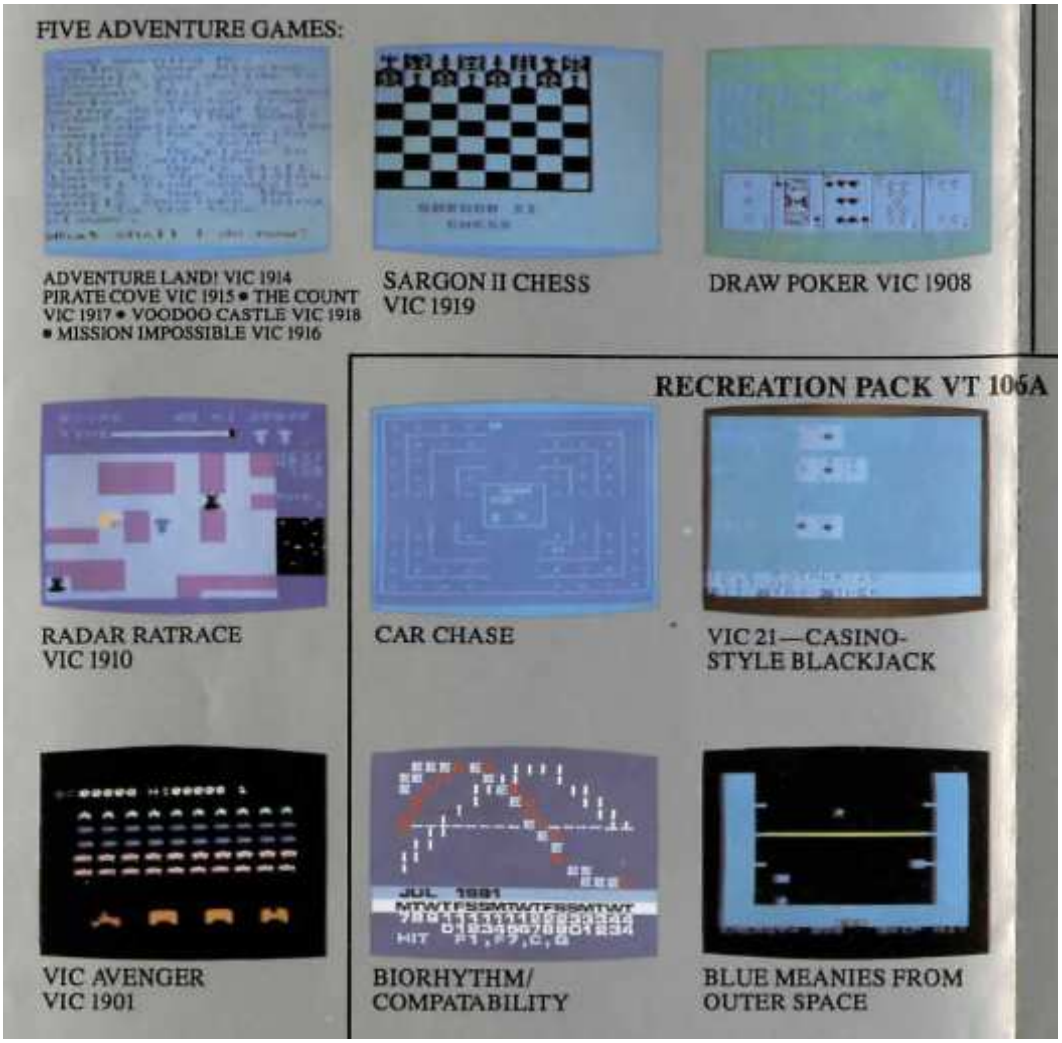

Figure 2.2 — Games advertised for the Commodore VIC-20 (promotional flyer).

Of the early home computer manufacturers, Commodore was undoubtedly one of the most international and it may fairly be said that it was probably the most Canadian. The company was born in Canada and Canadian money propelled it to new heights, but it was mostly run from the U.S. Its technology was almost exclusively created outside of Canada and its handful of manufacturing plants in Ontario mostly served the Canadian market (and did not just make computers). Finally, there is no evidence that Commodore supported any sort of systematic game development or publishing in Canada.

[93] Jonathan Chevreau, "Adam, Commodore season's hot sellers", *The Globe and Mail* (23 December 1983), p. B13; Stachniak and Campbell, *Computing in Canada*. p. 53. A production of 300,000 units would represent something like 25% of the worldwide production since the VIC-20 sold a million units by the end of 1982.

2.2.2 — Canadian videotex experiments: NABU and Telidon

Another way of accessing games was by videotex, which commonly used the television cable to allow users to retrieve information from a central computer and display it at home. Development efforts in Great Britain and France yielded mixed results, though the French were able to deploy and use the Minitel system down to the 1990s. In Canada, the alliance of the Communications Research Centre, a federal R&D laboratory, and of private concerns including phone companies led to the development (in 1978) and testing of the Telidon system. Starting in 1979, several field trials of Telidon delivered games to users.[94] In Alberta, a videotex system was slated for installation in the fall of 1979 inside about 120 homes in Calgary, offering "news, weather, sports and video games on a data channel."[95] In Manitoba, about 100 homes of the Winnipeg suburb of Headingley were to be equipped in 1980 to receive not only useful information but also "movie specials, sports events, video games and stereo music".[96]

Another trial of videotex technology seems to have been a test run south of Montréal in 1979 where home users communicated by phone with staffers in a computer centre run by Télécâble Vidéotron in order to play against a computer program with the resulting pictures flashed to their television screen at home. Games such as chess, checkers, backgammon, Blackjack, and Hangman were on offer.[97] A similar system, involving some of the same games plus baseball, football, golf, poker, and horse racing video games, was promised to Rogers Cable television subscribers in Brampton in 1980.[98]

Between 1981 and 1983, Bell Canada carried out the VISTA field trial of Telidon videotex in Toronto and Montréal. The 435 home users were able to access a number of games and quizzes. The content was issued by a number of providers, with Infomart experimenting "with interactive computer games, enhanced with Telidon graphics." In one Infomart game, the viewer travelled across a map of Canada, winning and losing points by demonstrating bilingual skills. Simultaneously, TVOntario conducted its own field trial, from 1979 to 1982, with terminals placed in institutions including schools, colleges, universities, and public libraries. Again, content was created by a number of providers. TVOntario prepared a couple of quiz games with extensive graphics, one flashing on the screen the national flags to be identified and another taking the student on

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[94] Stachniak and Campbell, *Computing in Canada*, p. 54; Ben Barkow, Veikko Piipponen, Darian Wallis, Tom Hay, Betty Scalzitti and Larry Hershfield, *Telidon Field Trial Evaluation* (Toronto: Behavioural Team 1983), p. 1; Udo Ruediger Keding, *A Criticism of the Dominant Model of Videotex as a Telecommunications Service as Exemplified by Prestel and Telidon* (M.A. Thesis. Simon Fraser University, 1983), p. 82.

[95] Barry Nelson, "The Provinces: Alarms, news and TV talk-back featured in 120 new homes", *The Globe and Mail* (5 May 1979), p. 8.

[96] Roger Newman, "Wired City Canada: Push buttons and MTS make the media the message", *The Globe and Mail* (4 August 1979), p. 8.

[97] Paul Roy, "Jouer aux échecs sur son écran de téléviseur", *La Presse de Montréal* (10 October 1979), p. D2. This is likely the VIDACOM™ system described by: Michel Dufresne, "New Services: An Integrated Cable Networks's Approach", *Cable '82*, pp. 156-160 [http://www.nctatechnicalpapers.com/Paper/1982/1982-new-services-an-integrated-cable-networks-s-approach/download], accessed 11/02/2015.

[98] "Briefly: Cable TV turns to fun and games", *The Globe and Mail* (17 November 1980), p. 17.

a trip around the world to improve country recognition. A similar map-based game tested for knowledge of Canada's provincial capitals, while "Geologic Mapping" led students from sampling a terrain's rock composition to creating a geological map on paper.[99]

The most ambitious outgrowth of videotex research in Canada may have been the NABU Network developed between 1981 and 1983. It was deployed by Ottawa's Skyline Cablevision between 1983 and 1986. Services included a menu of games available on line.[100] Unlike Telidon systems, NABU delivered entire files or programs to the home computer that was part of the system, either by cable or even by satellite.[101]

John Kelly, formerly of Systemhouse, had recruited a number of friends and colleagues in the data processing business to create NABU Manufacturing in 1981 out of an amalgamation of four Ottawa-area companies, one from Toronto, and one from Calgary. Two additional firms were later acquired. The original idea involved turning out microcomputers and home computer terminals to connect via videotex with cable television companies.[102] It was premised in part on the high cable penetration rate in Canada: about 80% of Canadian households were connected to a cable network, while only 52% of U.S. households were.[103] While video games were envisioned as a component as early as March 1982, details came in May as the company decided to bet on games that would use characters from popular comic strips, Johnny Hart's *B.C.* and *The Wizard of Id*. Games would be developed by NABU's own game designers and engineers under the supervision of Michael Bate in the hope of building "a Canadian games industry capable of competing for world-wide markets". [104]

Among the games eventually offered by NABU to Ottawa subscribers were *Air Traffic Controller*, *B.C.*'s *Quest for Tires* and *Grog's Revenge*, *Galaxian*, *Heli Tank*, *Kiddy Park*, *Moon Sweeper*, *Mummy's Tomb*, and *Q*Bert*.[105] While some of the games were bestsellers (*Q*Bert*) at the time and others came from Japan (*Galaxian*), perhaps through NABU's partnership with a Japanese corporation, others are hard to track down and may be among the games developed in Canada at the company's behest, besides the well-

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[99] Joy Wilson, *Educational Applications of Videotex/Telidon in Canada* (Toronto: TV Ontario, 1984), pp. 19-21, 26-28

[100] Bryan Dewalt, *Building a Digital Network* (Ottawa: National Museum of Science and Technology, 1992), pp. 49-51; Stachniak and Campbell, *Computing in Canada*, pp. 54-55.

[101] Thomas, *Knights of the New Technology*, pp. 54, 71-78.

[102] Bleackley and LaPrairie, *Entering the Computer Age*, p. 108.

[103] Graham Hughes, "Nabu goal: To make first Canadian microcomputers", *The Ottawa Citizen* (23 March 1982), p. 53.

[104] Graham Hughes, "Nabu adds video games to service", *The Ottawa Citizen* (31 May 1982), p. 22.

[105] Mike Slinn, "Nabu cast a long shadow", *Mike Slinn — Connoisseur of Technology* [http://mikeslinn.blogspot.ca/2004/12/nabu-cast-long-shadow.html], created 18/12/2004, accessed 11/02/2015; "NABU Network Collection", *York University Computer Museum* [http://www.cse.yorku.ca/museum/collections/NABU/nabu.htm], accessed 11/02/2015; "NABU Network Reconstruction Project at YUCOM", *York University Computer Museum* [http://www.cse.yorku.ca/museum/research/NABU.htm], accessed 11/02/2015; Jim Ducharme, "The NABU Network: The Internet before the Internet", *PCworld.ca* [http://www.cse.yorku.ca/museum/press/nabu_pcWorld.pdf], created 4/12/2005, accessed 11/02/2015.

known *Quest for Tires* and *Grog's Revenge* from the Sydney Development Corporation. Such was the case of *Heli Tank*, originally created as *Mania* (1983) by George Gallagher, a young programmer. He may have been one of the enthusiasts running a computer camp for the Ottawa Board of Education in 1982 who were hired to work on a part-time basis in NABU's games department.[106]

While videotex systems failed to gain as much traction as the governments and large corporations backing them had hoped for, electronic games drove a boom that swept the entertainment industry and facilitated the adoption of the personal computer.

2.2.3 — The First Canadian Video Game Companies

The first stirrings of Canadian interest cannot be dated back much before 1983, though a few Canadian publishers are known to have been active as early as 1982, such as Commercial Data Systems in Saskatchewan or Toronto-based Windmill Software.

Commercial Data Systems, based in Regina and then Emerald Park, first released in 1982 a slew of clones of more popular games, including versions of *Centipede* (*Centipod* and perhaps *Bug Spree*), *Frogger* (*Road Toad*, *Froggee* and perhaps *Frogee*), *Donkey Kong* (*Witch Way*) and maybe even *Pac-Man* (*Motor Mouse*). While its 1983 titles included *Pegasis* (a clone of *Joust*), it published a more original game, *Frantic Freddie*, developed by Kris Hatlelid who went on to work for Distinctive Software and Electronic Arts.

Also appearing in 1982 were Telegames Software, based in Hampton, Ontario, and Syntax Software, based in Willowdale, Ontario. Both marketed VIC-20 games, whose originality cannot be determined since most of their titles apparently sank without comment. For the record, the 1982 games of Telegames Software included *Breakaway*, *Car Race*, *Chasm Challenge*, *Concentration*, *Deep Charge*, *Hangman*, *Meteorblast*, *Nubulis*, *Starwars*, *Super Trek*, *Target Zap*, and *Yahtze*. Those of Syntax Software included *Crabs*, *Tank War*, and *Cyclons*, the last one being later ported to the Commodore 64 and published again.[107] In 1983, Telegames Software marketed to VIC-20 owners games such as *Alien Hunt*, *Caterpillar*, *Grand Prix*, *Launch 2031 AD*, *Rebound Hockey*, *Video Panic*, and *Vik Kong*. The last three were later ported to the Commodore 64 by October of the same year.[108]

Windmill Software was founded by Rob Sleath in 1982, who had moved to Ontario from England at the age of ten. As a hobbyist, he had already created a battleship game for an early Radio Shack computer, but Windmill Software was not initially a game developer. However, after recruiting Ray Ewan, the new company produced *Video Trek 88* (mostly text-based) and *Floppy Frenzy* as IBM PC games in 1982. *Attack on Altair* (entirely text-based), *Moon Bugs*, *The Exterminator*, *Styx*, the quite popular *Digger*, and *Conquest* followed in 1983 with the assistance of Bill Montgomery. Sleath's final PC game was

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[106] Lungu and Stachniak, "Following TRACE: The Computer Hobby Movement in Canada", p. 23.
[107] Advertisements in: *Compute!* (October 1982), p. 200; *Compute!* (December 1982), pp. 105, 141.
[108] Advertisements in: *Commander* (July 1983), p. 113; *Commander* (October 1983), p. 67.

Rollo and the Brush Brothers in 1984, but the company produced in 1985 a PC Jr game, *Vortex* (largely inspired by *Tempest*).[109]

In addition to Windmill Software's *Floppy Frenzy*, one of the best candidates for the title of oldest Canadian-made video game would be the Commodore VIC-20 "shoot 'em down" program *Allied Defense* in 1982, authored by Kevin Kieller and John Traynor. Born in the United States, Kieller moved to Canada with his parents when he was thirteen and collaborated with Canadian-born John Traynor three years later on the creation of the game.[110]

Figure 2.3 — Opening screen of the Commodore VIC-20 game *Allied Defense* (https://www.youtube.com/watch?v=YgABM6E7DCY)

The first commercially successful video game created in Canada is usually identified as either *Evolution* or *B.C.'s Quest for Tires*, both published in 1983 by Vancouver's Sydney Development Corporation.[111] *Evolution* was created in 1982 by Don Mattrick and Jeff Sember, two teenagers from Burnaby already making the news in December.[112] By March 20, 1983, mounting sales led to an appearance by Mattrick and Sember on CBC's *Front Page Challenge*. They claimed on-air that *Evolution* was the first widely released, commercially profitable Canadian video game.

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[109] Andrew Jenner, "About Windmill Software", *Digger* [http://www.digger.org/windmill.html], accessed 11/02/2015. *Attack on Altair* is sometimes dated to 1982.
[110] Kevin Kieller, 2015. (Private communication) Kieller later acquired Canadian citizenship and became a dual citizen.
[111] Peter Nowak, "The evolution of video games in Canada" [http://www.cbc.ca/news/technology/the-evolution-of-video-games-in-canada-1.914304], created 10/09/2010, accessed 27/10/2014.
[112] Deborah Dowling, "Video games manufacturers feeling the electronic pinch", *The Ottawa Citizen* (14 December 1982), p. 43.

Vancouver's Sydney Development Corporation was relaunched in 1978 by Tarrnie Williams as a business software company. However, it diversified into video games in 1983 after its programmers created a game in their spare time as a result of a scene observed from their office with a view of the Granville Street Bridge:[113]

> "The steady flow of traffic was broken one day when a bus caught fire as it was crossing, causing commotion on the bridge and inspiration among the programmers. One of the, Jay MacDonald, duplicated the scene on his terminal, with orange tips of flame dancing from his electronic bus. Then the whole group got carried away with MacDonald's video game, adding runners who raced across the bridge and could be hit or missed by the burning bus. A dive bomber suddenly appeared to decrease the poor runner's chances. Things worsened further for the joggers with the addition of shell-firing tanks, flying bats, tree, and fire hydrants that would materialize at unpredictable times and places."[114]

This decided Williams to open a games division of the Sydney Development Corporation. After launching Mattrick and Sember's independently created *Evolution*, the new division took shape by acquiring in March a small high technology firm in Ottawa, Artech Integrated Accessories, obtaining the cartridge and disk rights for the characters of Johnny Hart's cartoon strip *B.C.* and *The Wizard of Id*, and contracting with Sierra On-Line to provide the U.S. publisher with new games.[115]

Also in 1983, Canadian inventor Andrew Tarc was granted a patent (# 1144648) for an electronic chess game using optical display segments. Hybrid games combining the features of traditional board play with the versatility of a personal computer began to appear as well. Nova Scotia-based Simulations Canada produced wargames combining a board with a text-based computer program (for Apple II, Amiga, DOS or Commodore 64), such as the 1985 *Golan Front* title.[116]

Another early video game, David L. Clark's *Sopwith*, was strictly a demonstrator created in 1984 to display the use of a new computer networking product from BMB Compuscience in Milton.[117] Chris Gray's game development career also began in 1984 with the game *Boulder Dash* created in collaboration with Peter Liepa. He went on to create alone the game *Infiltrator* (1986), whose success allowed him to go into business as a game developer.

In 1984, Commodore started including the game *Jack Attack* in its offerings for several computer models. Created in 1983 by Toronto students Kevin Kieller and John Traynor,

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[113] Thomas, *Knights of the New Technology*, pp. 144-146.
[114] Thomas, *Knights of the New Technology*, p. 147.
[115] David Stewart-Patterson, "Sydney Development gets video games unit", *The Globe and Mail* (11 March 1983), p. B16; Barbara Crook, "Firm stakes future on prehistoric character", *The Ottawa Citizen* (20 September 1983), p. 49. NABU retained the cable rights to Hart's character, but NABU's Bate jumped ship to oversee the new Ottawa-based games division.
[116] Harrington, William H. "Golan Front: A Computer Game of the 1973 Arab/Israeli War in the North", *Computer Gaming World*, Vol. 5.5 (November-December 1985), pp. 48-49.
[117] David L. Clark, "Sopwith" [http://davidlclark.com/page/sopwith], accessed 11/02/2015.

the game *Cubic Critters* was renamed *Critter Crisis* before being dubbed *Jack Attack* by Commodore staff, referring to the legendary dressing-downs of founder Jack Tramiel.[118]

Figure 2.4 — Spectacularly ugly cover of the Commodore Plus/4 international edition of the game *Jack Attack* (http://plus4world.powweb.com/software/Jack_Attack).

2.2.4 — Canadian Makers

Besides Commodore, other companies were producing video game consoles or game computers in Canada during this period. The Kitchener company Electrohome probably helped manufacture the Sears Tele-Games Speedway from Atari for the Canadian market in 1976-1977. It went on to produce several models of monitors for coin-operated video games from Atari, Sega, and other companies.[119] In addition to gaming monitors, it also produced Telidon terminals at a time when videotex systems often included computer games with elementary graphics. Electrohome archives indicate that the company also had dealings with Apple (1985-1986) relating to the Apple II and Macintosh, going back at least to its 1982 design of a colour board for the Apple II. Its videotex terminals were marketed as far away as Argentina in 1985. In 1987, Electrohome invested even more in

[118] Tristan Donovan, "Computer pioneer Jack Tramiel relied on, then dismissed, video games" [http://www.gamasutra.com/view/news/168539/Computer_pioneer_Jack_Tramiel_relied_on_then_dismissed_video_games.php], created 13/04/2012, accessed 8/02/2015. Part of the Commodore 64 *Jack Attack* video game is playable on the Internet Archive: https://archive.org/details/C64Gamevideoarchive15-JackAttack.

[119] Anita Streicher, Anita. "Electrohome", *Doors Closed* [https://doorsclosedwaterloo.wordpress.com/electrohome/]. Accessed 11/02/2015.

video display technology by acquiring related assets from Scarborough company Gigatek Limited. In 1991-1993, it was negotiating with a Greek company about the distribution of display systems, while its separately developed video projection technology was sold for use in California as part of INGOLF's computerized golf simulator.[120]

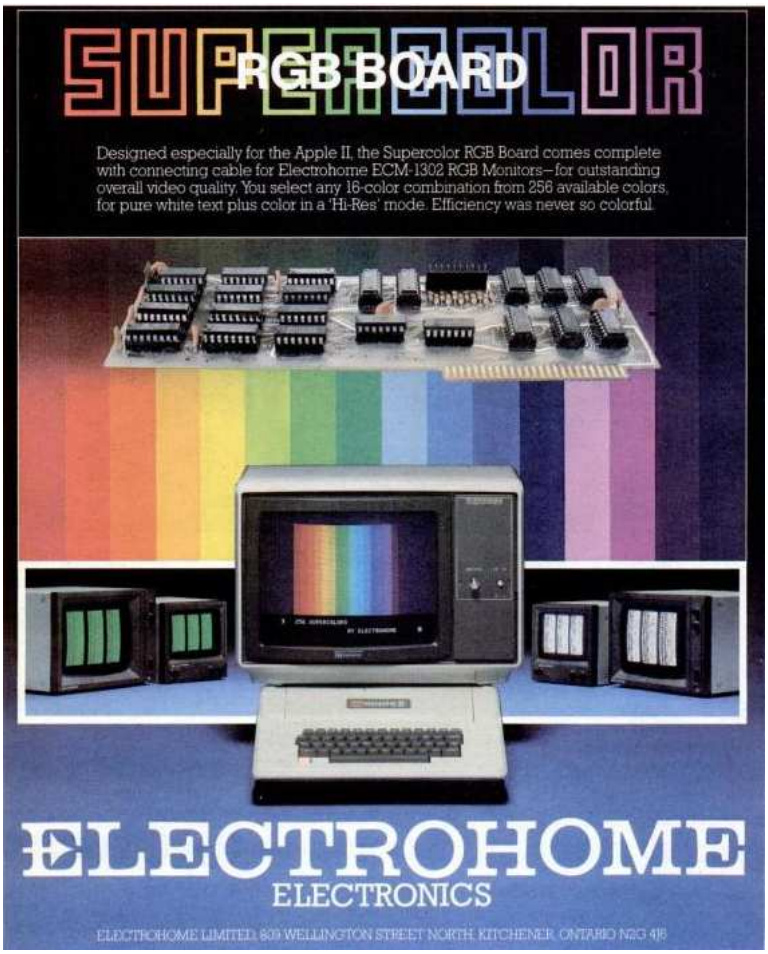

Figure 2.5 — Electrohome advertisement for the Supercolor RGB board and the ECM-1302 monitor (*InfoWorld*, Vol. 4, Number 9, 8 March 1982, p. 6.)

In 1979, Coleco Canada may have been the country's largest manufacturer of games and toys, with yearly sales of $30 million. The previous year, it had invested a million dollars in its Montréal plastic moulding factory.[121] By 1983, Coleco's home computer, Adam, was selling so well (Figure 2.6) that Coleco Canada could only fill about half of its pre-Christmas orders.[122] In spite of the video game crash, Coleco pressed on and announced in December 1983 that it would expand Québec production of its Coleco-Vision line of

[120] "Electrohome fonds. Finding Aid: GA 186", University of Waterloo Library, pp. 33, 39, 90, 95, 97, 102, 136, 224, 226, 228, 231, 234, 281 [https://uwaterloo.ca/library/special-collections-archives/sites/ca.library.special-collections-archives/files/uploads/files/ga186.pdf], accessed 11/02/2015.
[121] "Les affaires sont bonnes chez les fabricants de jeux électroniques", *La Presse de Montréal* (26 October 1979), p. D3.
[122] Chevreau, "Adam, Commodore season's hot sellers", p. B13.

video games, with the help of a federal subsidy, in order to become the first Canadian manufacturer of video games.[123] By July 1984, the plan was to ramp up production at the Saint-Henri plant in 1985 to supply all markets worldwide with video game hardware while making software cartridges for North America. This would let the parent U.S. company focus on making the Adam.[124] However, Coleco discontinued the manufacture of the Adam in early 1985.[125] Colecovision itself was abandoned later the same year.

Figure 2.6 — Full page advertisement in 1983 for Coleco's offer of a system including a game console and a home computer (*La Presse de Montréal*, 29 October 1983, p. 23.)

To round off this category, it may be mentioned that the Canadian manufacturer Integrated Plastics produced peripherals such as a game cartridge storage unit in 1981.[126]

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[123] Jay Bryan, "Coleco to expand Montreal plant", *The Montreal Gazette* (3 December 1983), p. D-3.
[124] Robert Gibbens, "Coleco Canada plans to make video consoles", *The Globe and Mail* (14 July 1984), p. B3.
[125] Reuters. "Coleco leaves computer market", *The Globe and Mail* (3 January 1985), p. B9.
[126] "T.V. Games Cartridge Organizer", *Personal Computer Museum* [http://www.pcmuseum.ca/details.asp?id=38245&type=Peripheral], accessed 11/02/2015.

2.3 — Panic Time

By 1980, several technological innovations combined to renew the excitement associated with arcade games. Vector graphics lent a sleeker, more detailed look to the objects on the screen, while dazzling colour replaced the tedious monochrome of earlier games. Game controls evolved, adding more buttons to the standard joystick, while the action became even more intense. When a new type of maze game attracted more gamers than ever, the stage was set for a craze that turned video games into a $5-billion industry within two years. The success of *Pac-Man* was a bonanza for Atari, which held the North American rights, but it also set the stage for its downfall as other companies realized they could just sell game cartridges to be played on Atari home systems. Not only did the quality of competing games deteriorate as a result of rivals seeking to make them as cheaply as possible, but the very nature of the games took an obscene turn.[127]

2.3.1 — North American Anxiety

By 1982, the seamier side of video games drew increasing notice once more. As video game tournaments with prizes for the winners spread to Canada, they potentially fell afoul of Canadian gambling laws if game play included an element of chance. The Metro Toronto Police therefore directed researchers at the Centre for Forensic Sciences to play *Pac-Man* and *Centipede* during the first weeks of summer to find out.[128]

Outside Canada, the video game boom had opened the door to the creation of pornographic video games, both in the United States and in Japan in 1982 and 1983. While the Japanese *bishojo* games were not exported on any scale, such games as the U.S.-made *Custer's Revenge*, featuring an aboriginal woman tied to a post so that she could be raped, could be played on any compatible Atari console and the nearest market was Canada.[129]

The panic was on. Public alarm was all the greater because the early adopters of the gaming bubble were often minors and young adults, the youngest of whom would not be trusted readily to withstand the supposed temptations of seedy arcades outside of the family home. While Montréal's by-law barring minors from arcades had been struck down in court but was being appealed, Vancouver stuck to its own by-law forbidding minors from sharing the same location with a video game machine. In the spring of 1982, arcade games were removed from convenience stores as police contended that

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[127] Donovan, *Replay*, pp. 81-93, 98-100.

[128] Wendy Warburton, "Video Games: Police want to know if it's skill or luck that spells winner", *The Ottawa Citizen* (19 July 1982), p. 33. The element of luck would not become an intrinsic part of game design until the success of such games as *Bejeweled*, developed in 2001 by a U.S. company co-founded by Canadian Jason Kapalka. See: Donovan, *Replay*, pp. 360-362.

[129] Donovan, *Replay*, pp. 98, 155-157. Other sexual video games announced in 1982 included *Bachelor Party* and *Beat 'Em and Eat 'Em.* See: Associated Press, "Video games for adults", *The Globe and Mail* (6 October 1982), p. 19.

"some kids may be stealing money to spend on these machines."[130] Simultaneously, parents throughout the Toronto area agitated for a crackdown, including a ban on all machines, whether in arcades or convenience stores, within 300 meters of a school. One school principal asserted that avid gamers would spend their lunch allowance, borrow or steal until they went hungry: "The pinball machines are all part of an alienating process for them. They become alienated at home, at school, from their parents and from their friends. Ultimately, they can become alienated from society."[131]

Video games were also tremendously popular in Québec, and just as controversial. By 1982, there were 40,000 slot machines in the province's amusement arcades alone. A 1981 Laval police report stoked public concern by alleging that teenagers were being drawn to arcades to the detriment of their attendance record in school and of their academic performance, to the point where students showed up in class under the influence of alcohol or drugs, or fought to settle a grievance brought back from the arcade.[132] In June 1981, the Irwin Toy company was sued by Québec's *Office de protection des consommateurs* for violating the province's law on advertising for children by purchasing ads for *Pac-Man* during television shows including *Happy Days*, *The Muppet Show* and *L'incroyable Hulk*.[133] Elsewhere, a Calgary city committee recommended imposing a curfew on gamers 16 years of age and under, who would be unable to visit an arcade after 10 pm without a chaperone.[134] In the United States, the hostility to video and computer games was also fed by the opposition of the Christian right to role-playing games in general.[135]

The voices of gamers were rarely heard. Even the two teenagers shooting for a world record *Asteroids* high score in Halifax in 1982 were not asked to give their opinion of the new city ordinance that would ban minors from video arcades and bar such establishments from operating within a kilometer of a school.[136] One exception was an older player in Ottawa who claimed the local arcades were clean, though the ones in Toronto and Vancouver were definitely sleazier.[137]

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[130] Mark Budgen, "By-law aimed at video games sparks Vancouver crackdown", *The Globe and Mail* (12 April 1982), p. 10.

[131] Ross Laver, "Bylaw in works to limit pinball playing", *The Globe and Mail* (6 April 1982), p. CL10; John Haslett Cuff, "Cityscapes: The problem with Pac-Man", *The Globe and Mail* (17 April 1982), p. F6. After much wrangling, the ban was rejected in 1983. See: "In Brief: Ban on pinball rejected by council", *The Globe and Mail* (8 February 1983), p. 5.

[132] Nicole Beauchamp, "Les « Arcades de jeux » : L'industrie roule sur des millions", *La Presse de Montréal* (27 August 1982), p. C1.

[133] Presse Canadienne, "Irwin Toy plaide le vice de forme pour se soustraire à une injonction", *La Presse de Montréal* (19 October 1982), p. A15.

[134] Canadian Press, "Curfew urged on players of video games", *The Globe and Mail* (9 December 1982), p. 21.

[135] Donovan, *Replay*, p. 147.

[136] Michael Harris, "Killing asteroids by the hour for a place in the record book", *The Globe and Mail* (6 July 1982), p. 1; "Video-Game Champions", *The Globe and Mail* (13 July 1982), p. 9. Ron Clark and Mike Cooper did achieve a high score of 100 million after just under 219 hours of combined play on one quarter.

[137] Graham Hughes, "Video games financial bonanza", *The Ottawa Citizen* (3 May 1982), p. 21. A local operator banned students from his arcades during school hours and enforced house rules proscribing drinking, smoking and swearing.

The media relayed instead terms such as “computer addict”, “hacker”, “phreak”, “cyberphile” or “video vampire” without always understanding what they might designate. Video games were accused of spurring crime or compared to smoking or cocaine use in their addictiveness (though it was acknowledged true computer addiction affected no more than about 1% of users). *The Globe and Mail* mentioned the case of a high school student who felt that he couldn’t attend classes without a preliminary fix of video games and quoted another one who said, when asked how he would react if his computer was taken away, “I would feel at the point of wanting to commit suicide.”[138]

The very popularity of arcade video games also accounted for the high levels of concern.[139] Pinball arcades had always been unsavoury gathering spots, but their appeal had been too limited to trigger the systematic curfews, bans, and exclusion zones that were proposed to keep young minors away from the new, radically addictive arcades of the video game era.[140] Indeed, resisting the lure of arcades sometimes justified the purchase of video games at home to keep children from watching too much television or seeking out the nearest pinball parlour.[141] Perhaps not coincidentally, the rapid growth in the number of home computers available for games in Canada (84,000 in 1981) was accompanied by forecasts of even further growth.[142] Public concern became a given justifying more press coverage: in March 1983, Montreal’s *La Presse* reproduced a report on a Japanese children’s gangs involved in car and home burglaries.[143]

In December 1982 and January 1983, Canadian customs official successively prevented *Custer’s Revenge* and *Beat ‘Em and Eat ‘Em* from entering the country.[144] By then, it was clear that the video games bubble was imploding and the problem slowly lost some of its urgency. One possible legacy of this period of heightened concern was an academic study of arcade video games and gamers in Montréal around 1985, which found about 10% of women present (though almost half did not play), almost exclusively male representations and voices within the 21 most popular games, and a strong preference for solitary play. The verdict was negative, indicating that the public “should be critical of

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[138] Kirk Makin, “Video-game habits spurring more crime, youth’s lawyer says”, *The Globe and Mail* (12 July 1983), p. 4; Stephen Strauss, “Computer crazy: the ‘addiction’ grows”, *The Globe and Mail* (13 May 1982), p. T1.

[139] Even amid rising worries about video games, the 1982 Canadian National Exhibition offered two areas of arcade video games, Video World and Futureworld, with *Pac-Man* and *Asteroids* on offer, along with competitions and prizes. See : Michael Tenszen, “Hog calls, video sports new features at CNE”, *The Globe and Mail* (18 August 1982), p. 5.

[140] By 1981, the traditional pinball machine was losing more and more ground to video games, even in arcades. See : Geoffrey York, “Pinball machines losing popularity to video games”, *The Globe and Mail* (8 June 1981), p. 4.

[141] Ellen Roseman, “The Consumer Game: Video games: plenty of choice in latest indoor craze”, *The Globe and Mail* (10 December 1981), p. T1.

[142] Strauss, “Computer crazy”, p. T1.

[143] Associated Press, “Au Japon, des gamins cambriolent pour assouvir leur passion du « Pac Man »”, *La Presse de Montréal* (19 March 1983), p. D6.

[144] Jacquie Miller, “Customs bans another pornographic video game”, *The Ottawa Citizen* (11 January 1983), p. 5. The game *Bachelor Party* was allowed in.

arcade video games and attempt to exert some control on children's access to these games and on the video game industry".[145]

Finally, a short *Globe and Mail* editorial in January 1983 waxed philosophical about the tawdrier themes of new video games, concluding: "A rapist, a robber and an arsonist. Electronic technicians have independently reached the unflattering conclusion that these are the roles we would most like to play when pushing the buttons and twiddling the knobs of video games. Could they possibly be right?"[146]

2.3.2 — The Crash and its Aftermath

In January 1983, the computer was *Time* magazine's Machine of the Year, the cover showing a personal computer inside a private home.[147] Meanwhile, the oversupply of arcade games and the overproduction of video titles had caught up with the North American video game industry. Yet, until Atari's December announcement of radically slower growth than expected, hopes had been high for the Christmas season in spite of the heavy competition.[148] In Canada, *The Globe and Mail* published a round-up of potential gifts just for video game console owners.[149] However, Ottawa sellers quickly began to replace video games with home computers as local interest for the latter mounted.[150]

By the end of 1983, though, the boom in arcade and computer games would be on its last legs. Yet, this was far from clear to everybody. In March, the CRTC allowed a Rivière-du-Loup cable company to add video games to its cable offerings.[151] In June, Canadian Pacific Airlines tested video games for rent during long flights between Vancouver and Amsterdam so that passengers who paid $3.50 could play *Donkey Kong* and other games to their heart's content. The one-month test run compared the Airplay offering from California-based Altus Corporation and the Air Video product submitted by a Toronto partnership headed by Michael Thorek.[152]

A year later, after the crash, Air Canada and other airlines decided to offer handheld video games (including *Donkey Kong*, *Frogger*, Scrabble, blackjack, chess, and poker) to their captive audience for a fee. While the games were to be manufactured by the California company Avicom, CP Air was said to be planning the installation of 6,500 games machines for February 1985 to be adapted to table trays. These were to be

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[145] Claude M. J. Braun and Josette Giroux, "Arcade Video Games: Proxemic, Cognitive and Content Analyses", *Journal of Leisure Research*, Vol. 21, Number 2 (1989), pp. 95, 98-99, 101-103.
[146] "In whose fantasy?", *The Globe and Mail* (19 January 1983), p. 6.
[147] Bagnall, *Commodore*, pp. 459-460.
[148] Donovan, *Replay*, pp. 96-106.
[149] Stephen Isaacs, "Playback: Video gifts for a plugged-in Christmas", *The Globe and Mail* (11 December 1982), p. 11.
[150] Deborah Dowling, "Video games manufacturers feeling the electronic pinch", *The Ottawa Citizen* (14 December 1982), p. 43.
[151] "Video games", *The Globe and Mail* (9 March 1983), p. B4.
[152] "Video Games", *The Milwaukee Journal. Special Section: Electronics for Christmas* (17 November 1983), p. 1; Roger C. Sharpe, "Flying the Friendly Skies", *Video Games*, Vol. 1, Number 12 (September 1983), p. 14.

manufactured by the Toronto company Air Video, which would be relying on the technology for which Thorek applied in 1984 to get a Canadian patent (issued in 1986 as #1203552).[153] Thorek had been inspired by the tedium of a trip to the Caribbean to come up with a better use for the tray.[154] Since the rebranded Canadian Pacific Air Lines was in some financial trouble, which would lead to its fire sale in 1987, it may not be surprising that things did not work out. By May 1985, Thorek was suing Air Video.[155] However, Air Video was still a going concern in January 1986 when it was described as "a company that plans to install video games on major airlines".[156]

Figure 2.7 — Cartoon by U.S. illustrator Don Addis (1935-2009) mocking the prospect of video games on planes.

While Air Video fell by the wayside, the Montréal company DTI Software, founded in 1995, would eventually come to provide in-flight entertainment and video games to a significant fraction of the world's airlines. Another Montréal company, Inflight Canada has specialized in recent years in providing the equipment needed to supply power to the seat-back electronics needed for screens and games. Founded in 1976, it has specifically developed patented technology (US # 6572054 and # 6585189 issued in 2003) to protect the onboard wiring.

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[153] Steve Stecklow, "Sky arcade: Airlines will offer video games on flights in next few months", *The St. Petersburg Evening Independent* (22 November 1984), p. 4-A.
[154] "Airplane Trays May Contain Video Games", *The Ocala Star-Banner* (30 July 1983), p. 8A.
[155] "Report on Osgoode Hall court proceedings", *The Globe and Mail* (30 May 1985), p. B8.
[156] Philip King, "Where are they now?", *The Globe and Mail* (7 January 1986), p. C3.

2.3.3 — Canada's Pirates

Few Canadian manufacturers of legitimate video games or gaming systems can be identified during this period, but there was a thriving cottage industry of Canadian makers of arcade games whose production came to light after the crash. In 1983, U.S.-based makers of arcade video games were no longer willing to countenance Canadian companies building arcade machines for 60% less than the sales price of U.S. machines. Lawyers and other representatives of companies such as Bally-Midway and Nintendo used interim court injunctions to search homes and confiscate games. Such arcade games were rarely exact copies since the trademarked name would be changed, the game play would be tweaked, and the cabinet would be home-made, but the computer game boards were often imported straight from Japan. William Koster, the president of Quantrex Electronics in Ajax, defended the practice: "It may be morally wrong, but legally it's right".[157]

Indeed, the Canadian bootleg industry was aware of a legal difficulty in Canadian law. As a textual expression, a computer program fell under the copyright law, though the act had nothing to say about software. However, the strictly functional purpose of programs seemed to require patent protection. By 1986, one test case (Apple vs. Mackintosh) led to a general acceptance by Canadian courts that software should be classed as literary works in spite of their utilitarian nature.[158]

In 1983, the newly formed Game Builders Association of Canada claimed fifty members and intended to lobby the Canadian government for a clarification of the copyright issue. While many Canadian makers of bootleg games were small-scale operations employing no more than one or two people, but MJZ Electronics Ltd. of Toronto, owned by Zalman Shlyonski and Joseph Levitan, among others, had six employees. Such businesses were found in Toronto, Montréal, Winnipeg, and Calgary.

This nascent bootleg games industry vehemently protested the lawsuits and confiscations. Even if the seized machines were to be returned after a trial, the market life of arcade games was so short that the machines would be worthless. For its part, Nintendo argued that illegal copies of *Donkey Kong* outnumbered legitimate versions nine to one in Toronto in 1982.[159] The proliferation of the cheap pirated Canadian games, selling for about half the $2,000 to $3,000 price of legitimate machines, was later blamed for overcrowded arcades unable to sell off their older machines at a reasonable rate to make room for new ones.[160]

While the decline of the arcade business dried up the market for the Canadian copies, one legacy of the short-lived industry was the creation of the JVL company in 1984 by Joseph Levitan and his son Valery. What was initially a small coin-operated machine repair

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[157] David Helwig, "Tactics questioned as video game border war heats up", *The Globe and Mail* (2 May 1983), p. B4.
[158] Robert Tomkowicz, *Crossing the Boundaries* (Ph.D. Thesis. University of Ottawa, 2011), pp. 78-79.
[159] Helwig, "Tactics questioned as video game border war heats up", p. B4.
[160] Norman Provencher, "Booming arcade game faces shakeup", *The Globe and Mail* (18 July 1983), p. B3.

service turned by 1995 into a producer of touch-screen amusement games that turned to video slot games in 2008.[161] The younger Levitan obtained patents on coin-operated video game terminals in 2000 and 2001 (Canadian patent # 2348317, US patents # 6514139 and # 6860808), with JVL Corporation holding at least five other patents in the video game field.

Any remaining ambiguity was cleared up by Parliament. In 1988, the Canadian Copyright Act was amended by Bill C-60, which was explicitly described as "pro-creator" by Flora MacDonald, the minister of communications and bill sponsor. The revised copyright law specifically provided copyright protection for computer software as a result of pressure from the industries affected by bootleg copies of computer programs, including video games, and by the cloning of both Apple computers and the IBM PC.[162]

2.4 — Conclusions

There remain several unanswered, and perhaps unanswerable, questions about the adoption of video games in Canada during this period. Did the legal uncertainty surrounding both arcade games and software discourage Canadian entrepreneurs from entering the video game field during this period? Was it the absence of a national champion in the field, a company that would have set an example for others? Or should it be attributed to the official conviction that the future belonged to videotex?

2.4.1 — Computer Games From Everywhere But Canada

Between 1980 and 1985, computer games were developed by the dozen (or more) in a number of countries. Besides the United States and Japan, the United Kingdom, France, Germany, and Australia are all noted by Donovan. Was it the lack of an omnipresent personal computer that would encourage gamers to develop and share independently-designed games? The French game industry only developed once a market shake-down only left a few popular platforms for computer games.[163] The paucity of companies making microprocessors in Canada down to the early 1980s may also have hindered homegrown efforts, unless it was the early dominance of Commodore that drew many programmers away from the platforms (Apple and PC) that would eventually prevail.[164]

Or was it the effect of ongoing game piracy abetted by ineffectual copyright laws? In 1983, one Canadian video game retailer claimed that at least 60% of all video games sold in Ontario were unauthorized knock-offs.[165] The demise of several early European game companies is blamed by some on the flourishing European demoscene between 1985 and

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[161] "About JVL", *JVL Labs* [http://www.jvlgaming.com/about.html], accessed 11/02/2015.
[162] Blayne Haggart, *Copyfight* (Toronto: University of Toronto Press, 2014), pp. 154, 295; Linda Bien, "Canadian Visual Resources and Canadian Copyright", *Visual Resources: An International Journal of Documentation*, Vol. XII, Number 3-4, p. 421; Stachniak and Campbell, *Computing in Canada*, pp. 58-60.
[163] Donovan, *Replay*, pp. 111-137.
[164] Thomas, *Knights of the New Technology*, p. 123. Only Northern Telecom, Mitel, and Linear Technoogy produced microchips in Canada as late as the early 1980s.
[165] David Helwig, "Tactics questioned as video game border war heats up", *The Globe and Mail* (2 May 1983), p. B4.

the mid-1990s, which encouraged both independent game programming and the disabling of copy protection on existing games to share them or create variants. Furthermore, the shift to games on home computer systems such as the VIC-20 and the Commodore 64 during the 1980s fostered a higher degree of piracy since disks and diskettes were easier to copy (or "crack") than either arcade video games or console cartridges.[166]

If it was assumed, or indeed accepted as a *de facto* reality, that Canadian authorities would not protect software before the 1988 amendments to the Copyright Act, few entrepreneurs would have felt safe investing their time and effort in the development of original games. It is striking that many of the first game developers in 1982-1984, such as Mattrick and Sember, Kieller and Traynor, or Gray and Liepa, were so young that such questions might not have worried them. Those who did grasp the situation may have determined that there was easier money to be made with clones of arcade machines, game programs, and game computers.

Another Canadian specificity was the vestigial traces of 19th-century industrial protectionism that still mandated a federal sales tax of 10% on imported goods in the early 1980s. Such duties and the associated delays were blamed by some for the failure of Canadian high-tech manufacturers to compete.[167] The role of the government may also be highlighted insofar as it threw much of its institutional weight and elite alliances behind the videotex technology that turned out to be a costly detour along the path to the modern internet.

2.4.2 — Canadian Video Games

Hypotheses accumulate, but there is one certainty. While the Canadian video game industry of the 1980s did not achieve the same visibility as those of other countries, it is clear from this chapter that Canadians were involved in the video game industry at almost every level.

[166] Donovan, *Replay*, pp. 133-135, 140-141, 208-209. Piracy is similarly blamed for the languishing of the post-Cold War Eastern European game industry during much of the 1990s.
[167] Thomas, *Knights of the New Technology*, pp. 64, 66. Thomas seems sympathetic to the view put forward by William Hutchison, though the latter is describing the situation in the early 1970s.