Defining Play:
Producers, Mediators, and Users in the History of Video Arcade Games, 1971-1985

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Jonathan Scott Clemens

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Advisor Thomas J. Misa

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Introduction

My dissertation is a history of video arcade games. It examines the actions and interactions of "producers," "mediators," and "users" in constituting the development, economics, and meanings of technology. I pay particular attention to how these groups of actors defined the social and technical characteristics of video arcade games, affecting such things as design philosophy, placement, and play patterns. This study provides an analytical and critical perspective on the history of video games, fills a significant lacuna in the history of computing, and contributes to ongoing scholarly discussions of how technologies arise, proliferate, and acquire significance.

Categories and Definitions

I use "video arcade games" to describe computer games housed in coin-operated (coin-op) cabinets and intended for placement in public areas. [1] I have settled on the term because it is narrowly focused on coin-op video games, compatible with present terminology, and alludes to the arcade spaces crucial to both meanings and economics. People contemporary to the rise of video games often referred to them as "electronic games," but the term is archaic, calls to mind hand-held electronic games, and is too broad. I have therefore rejected it for the sake of clarity. I utilize "video games" as a

[1] As pointed out by Henry Lowood, there is some question over whether early video arcade games can be thought of as computers due to a preponderance of video technology and a lack of written software code. Microprocessors were not integrated into video arcade games until 1975. However, producers and mediators described early video arcade games as computer technologies (users probably did as well, although this cannot be verified given available sources), and the logic circuits underlying early designs are consistent with special-purpose (though not general-purpose) computers. Henry Lowood. "Videogames in Computer Space: the Complex History of Pong." *IEEE Annals of the History of Computing*, Vol. 31, No. 3, 2009, p. 5.

broader category that includes not only video arcade games but also computer games and "home consoles" (single or limited purpose machines dedicated to video gaming).

I track the history of video arcade games from their introduction in 1971 to the release of the Nintendo Entertainment System (NES) home console to American markets in 1985.[2] The time frame encompasses a formative period from 1971 to 1975, a period of declining prospects from 1976 to 1978, an era of peak popularity from 1979 to 1982, and an industry crash beginning in 1983 and lasting through 1985. Secondary sources refer to a "Golden Age" of video arcade games, but there is little agreement over its boundaries.[3] For the purposes of this dissertation, I define the era as beginning in 1979, shortly after the release of *Space Invaders* (1978) and coinciding with the popularity of *Asteroids* (1979), and ending with the North American video game crash of 1983.[4] The interim

[2] The Nintendo Entertainment System was released in Japan two years earlier as the "Family Computer" (ファミリーコンピュータ) or "Famicom" (ファミコン).

[3] As summarized by Mark J.P. Wolf, "Kent places the Golden Age of the medium right before the Crash, Van Burnham's account of classic games range from 1971 to 1984, and *The Video Game Explosion*'s first major historical demarcation is titled "The Industry Rebounds (1985-94)." Mark J.P. Wolf. "Introduction," in Mark J.P. Wolf, ed. *Before the Crash: Early Video Game History* (Detroit: Wayne State University Press, 2012), p. 19.

[4] Per machine revenues of video arcade games were highest between 1979 and 1983. The statistics effectively mark the beginning and end of the "Golden Age." Unlike the years of the "Golden Age," the 1983 crash is not disputed. As described by Mark J.P. Wolf, "The history of video games is long enough to be divided into parts, and the periodization of video game history [occurs in multiple ways]... The Great Video Game Industry Crash of North America, however, is a turning point in almost all of these areas and separates early and later video game history as dramatically as the coming of sound separates sound film and silent film in film history." Ralph Lally, ed. "1984 – The Year of the Crunch," *Play Meter*, Vol. 10, No. 20, November 1984, p. 35-36.; Ralph Lally, ed. "Determining the Economic Health of the Coin-Op Industry," *Play Meter*, Vol. 9, No. 20, November 1983, p. 41; Ralph Lally, ed. "Play Meter Survey Findings: Too many games, too many operators… too little revenue," *Play Meter*, Vol. 8, No. 22, November 1982, p. 43; Ralph Lally, ed. "Play Meter Survey Results: Videos sweep to big gains in 1980," *Play Meter*, Vol. 6, No. 21, November 1980, p. 24-28; Ralph Lally, ed. "Survey, '76," *Play Meter*, Vol. 2, No. 8, August 1976, p. 20; Wolf, p. 2.

marked a time of high industry profits, user enthusiasm, and prominence in American culture.[5]

I investigate the history of video arcade games by looking at various "actors," or individuals and groups of individuals (businesses, professional organizations, communities, etc.) engaged in the "particular and located enactment or performance of technological knowledge and practice."[6] Actors approach, adopt, and/or utilize technologies based on a complex combination of personal volition and a situated network of cultural, economic, political, social, and epistemological forces. They both shape and are shaped by the context of a given technology as defined by their particular perspective.

"Producers" were actors that undertook and/or oversaw the creation and production of video arcade games. Two categories of producers were actively involved in video arcade game design. "Developers" engineered the hardware and software of video arcade games. They were responsible for gameplay elements, technological design, and the implementation of ideas. "Management" oversaw the development process. They influenced video arcade games by directing labor, making design demands, and enacting restraints. Ideas for a given game could and did stem from either sub-group. The "producer" category also encompasses a variety of support roles, including graphic

[5] Video arcade games can generally be thought of as "popular culture," but I find the term ambiguous and have thus avoided it. As described by sociologist Tom Kando "When discussing popular culture we may not have an exact definition at our finger tips, but we somehow generally agree that it has to do with high culture, mass culture and mass media, mass leisure and mass consumption, prole culture and prole leisure, subcultures and the counterculture. Each of these terms is, in turn, fuzzy and ill-defined. Yet they have both heuristic and pragmatic value… It is therefore under these conventional headings that a discussion of many different cultural phenomena can take place, and it is under the umbrella of Popular Culture that they somehow all seem to tie together." I agree with Kando's description, but not his conclusion. I have found the term to be too vague to have much analytical value. Tom Kando. "Popular Culture and its Sociology: Two Controversies." *The Journal of Popular Culture*, Vol. 9, No. 2, 1975, p. 438.

[6] John Law and Vicky Singleton. "Performing Technology's Stories: On Social Constructivism, Performance, and Performativity," *Technology and Culture.* Vol. 41, No. 4, 2000, p. 767.

design, business strategy, and advertising. I utilize the term "manufacturer" to describe large video arcade game companies (as opposed to small developer groups that lacked manufacturing capabilities) as a means of differentiating between producers as individual actors/groups of actors and the larger institutional and financial structures that organized and supported them.

"Mediators" were actors that purchased, distributed, and operated video arcade games. Unlike "producer" or "user," the term was not applied contemporaneously, but rather is a result of my analysis. After surveying sources I created the category to describe a set of actors that displayed a common set of priorities, pressures, practices, and goals within the coin-op amusement industry. Mediators performed crucial functions in the coin-op amusement industry, which encompassed video arcade games, pinball machines, and various mechanical or electromechanical devices. There were two types of mediators. "Distributors" purchased machines direct from manufacturers and handled complex repairs when machines malfunctioned. "Operators" obtained coin-op amusements from distributors through direct sale, lease, rental, or profit sharing arrangement. They placed machines on location (in bars, bowling alleys, restaurants, arcades, etc.) and typically rotated them between spaces in order to maintain novelty.

Mediators were the immediate market for video arcade games manufactured by producers. They therefore influenced video arcade games through "market feedback," or preferences and priorities as displayed by purchasing trends. Users were also important actors in market feedback, though their power to influence technological development

was largely dependent upon the transmission of their needs to producers by mediators.[7] Mediators gauged user behaviors and interests, created video arcade game spaces, and attempted to direct user tendencies for their own profit. They typically passed on user desires and practices to producers, sometimes directly and sometimes through buying practices. They also frequently reflected producer intentions through video arcade game spaces. In this way they served as "translators," described by Susan Douglas as actors who "transferred information between differently oriented and sometimes antagonistic sectors of society."[8] Their role was not "passive," but rather involved a great deal of "pushing" and "marketing" based upon their own visions and needs.[9] In a complex feedback mechanism, their choices generated, anticipated, and reacted to user needs in ways that are important when considering technological development, community formation, and meaning.

"Users" were actors who played video arcade games and patronized video arcade game spaces. Dedicated users who organized their leisure time and/or identity around playing video arcade games were "gamers." They congregated primarily in "video arcades," or spaces where video arcade games were the primary (and often sole) attraction. As described in chapter four, these areas served as foci for community formation due to the social characteristics of the space.[10]

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[7] Producers established a few mechanisms, such as video arcade game test locations and focus groups, to interact with users directly. However, the extent and influence of these practices is somewhat unclear in the sources surveyed. It is safe to say that they had an effect on technological development, but was unlikely an equal or greater effect than mediator market feedback.

[8] Douglas, 1985, p. 120-121.

[9] Douglas, 1985, p. 172.

[10] Chapter four, "Forming Community."

On a historiographical level, producers, mediators, and users are best understood as categorical roles. They serve to describe a particular viewpoint, set of motivations, and place within the technological, social, and economic system of video arcade games exhibited by a group of actors. Any given actor may play multiple roles, but while acting in a given role will be influenced by its dynamics. For example, a video game developer interacting with a game with an eye towards its design elements and underlying programming is acting in the role of a producer even though he or she is using the technology. The same person experiencing a game primarily as play or a social activity (camaraderie, competition, community interactions, etc.) is acting in the role of a user. These roles have some overlap and a given actor can switch between them, but they cannot comfortably be taken on simultaneously due to differing priorities and goals.

Overview of Sources

My schema stems from a combination of archival findings and past scholarship in the histories of technology, computing, and business. It is made possible by a wealth of previously unexplored archival materials on how each actor category influenced the history of video arcade games.[11] Many of the primary sources I utilize only recently became available thanks to efforts by the Stanford University Libraries and the

[11] This dissertation owes a debt to the several institutions for amassing collections of primary sources on the history of video arcade games. Stanford University Special Collections houses an impressive archive of Atari materials in the Al Alcorn papers, the Atari Inc. Business Plans 1974-1975, and the Steve Bristow papers. The International Center for the History of Electronic Games at the Strong National Museum of Play contains an impressive variety of video arcade game materials related to producers, mediators, and users. Their archival copies of *Arcade Express*, *Electronic Games*, *Play Meter*, and *RePlay* made especially valuable contributions to my analysis. Lastly, the Computer History Museum has collected key oral histories with principal actors and, through their exhibits on the history of video games, provided opportunities to speak with important figures.

International Center for the History of Electronic Games. I investigated and analyzed newly accessible archival collections by utilizing pre-existing historiographical models. My inquiry indicated that producers, mediators, and users were crucial technological actors.

The producers of technologies have long been a focus of academic study. As described by David Nye, a traditional "internalist" approach to the history of technology involves reconstructing "the history of machines and processes focusing on the role of the inventor."[12] Narratives about producers "establish a bedrock of facts about individual inventors, their competition, their technical difficulties, and their solutions to particular problems."[13] The model has been fruitfully applied to groups as well as individuals, especially by historians of business who focus on "managerial decision-making within the individual firm or industry" as it relates to innovation and historians of computing "focused largely on the machines themselves, tracing the path by which the electronic digital computer emerged."[14] The producer approach helps elucidate how and why technologies took on certain characteristics during the creation process. Adopting it has helped scholars explain (among other things) the social aspects of technology creation, how institutional structures and practices shape technological development, the influence of older technologies on newer inventions, the contingency during creation and

[12] David Nye. *Technology Matters: Questions to Live With* (Cambridge: MIT Press, 2006), p. 56.
[13] Nye, p. 56.
[14] Margaret B.W. Graham. "Technology and Innovation," in Geoffrey Jones and Jonathan Zeitlin, eds. *The Oxford Handbook of Business History* (Oxford: Oxford University Press, 2007), p. 350; Michael S. Mahoney. "What Makes the History of Software Hard," *IEEE Annals of the History of Computing*, Vol. 30, No. 3, July-September 2008, p. 9.

proliferation, and how technology and culture influence each other.[15] This dissertation provides an unexplored case study of these dynamics.

I investigate the role of producers by analyzing how they conceived, developed, implemented, and sold video arcade game technologies. My dissertation taps unexplored archival resources on Atari, Inc., the world's first video arcade game manufacturer. Two month-long research visits to extensive collections of Atari documents at Stanford University provided insights into the conditions of the early video game industry, the specifics of game development, the rationale behind the direction of innovation, and producers' assumptions of how and why their products would be experienced. Additional insights into the producer perspective were gained from oral histories collected by the Computer History Museum and interviews with principal figures published by journalists. These provide subjective, human, on-the-ground perspectives that speak to tacit knowledge and the messy day-to-day details of work. My research indicates that business structures, strategies, and cultures played an important role in the history of video arcade games.

Mediators are understudied as crucial technological actors. Historians have demonstrated that certain type of mediators (particularly advertisers, entrepreneurs, salespeople) have a great deal to do with the economic success and cultural

[15] See, for example, Janet Abbate. *Inventing the Internet* (Cambridge: MIT Press, 1999); John Agar. *The Government Machine: A Revolutionary History of the Computer* (Cambridge: MIT Press, 2003); William Aspray and Paul Ceruzzi, eds. *The Internet and American Business* (Cambridge: MIT Press, 2008); Paul Ceruzzi. *A History of Modern Computing* (Cambridge: MIT Press, 1998); Paul Edwards. *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge: MIT Press, 1996); Nathan Ensmenger. *The Computer Boys Take Over: Computers, Programmers, and the Politics of Technical Expertise* (Cambridge: MIT Press, 2010); Lisa Gitelmen. *Scripts, Grooves, and Writing Machines: Representing Technology in the Edison Era* (Stanford: Stanford University Press, 1999).

characteristics of consumer goods.[16] Nonetheless, it is rare for mediators to hold central roles in narratives on the history of technology. A few notable and successful exceptions suggest that this is an oversight. For example, Regina Blaszczyk identifies "fashion intermediaries" as "the primary agents of innovation" during the American consumer revolution of the late 19th and early 20th centuries.[17] Her attention to mediators as important historical actors reveals that the creation of consumer products was an "egalitarian" rather than (as was often assumed) a top-down process.[18] "Seasoned fashion intermediators" were able to gauge and imagine consumer tastes in ways that were crucial to the batch production system of glassware and china.[19] My work similarly indicates that video arcade game mediators exercised considerable influence over producer development, user experiences, and public perceptions, and suggests that they deserve greater historiographical attention.

I construct the mediator perspective primarily through coin-op industry sources, especially the trade publications *Play Meter* and *RePlay*. The International Center for the History of Electronic Games at the Strong National Museum of Play recently acquired a collection of copies published between 1974 and 1985. I was able to examine them during two research trips. Additional aspects of the mediator perspective are reflected in

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[16] See, for example, Susan Benson. *Counter Cultures: Saleswomen, Managers, and Customers in American Department Stores, 1890-1940* (Champaign: University of Illinois Press, 1988); Joshua M. Greenberg. *From Betamax to Blockbuster: Video Stores and the Invention of Movies on Video* (Cambridge: MIT Press, 2008); Pamela Walker Laird. *Advertising Progress: American Business and the Rise of Consumer Marketing* (Baltimore: Johns Hopkins University Press, 1998); Jeffery R. Yost. *The Computer Industry* (Westport: Greenwood Press, 2005); Olivier Zunz. *Making America Corporate, 1870-1920* (Chicago: University of Chicago Press, 1990).

[17] Regina Lee Blaszczyk. *Imagining Consumers: Design and Innovation from Wedgewood to Corning* (Baltimore: Johns Hopkins University Press, 2000), p. 12.

[18] Blaszczyk, p. 12.

[19] Blaszczyk, p. 15.

industry analysis undertaken by Atari, photographic records of video arcade game spaces, and the recollections of users. These sources must be treated carefully due to their origin, but can be used in combination with mediator accounts to create a more robust picture of structures and practices.

Users of technologies have become an increasingly frequent focus of academic inquiry. Works such as Susan Douglas' *Listening In* and Kristen Haring's *Ham Radio's Technical Culture* have shown that the use of technology can have important cultural effects, and may be appropriated to facilitate the creation, perpetuation, and/or conditions of a given culture or subculture.[20] Similar to gamers, both Douglas' "imagined communities" (listeners of particular programs and genres of radio) and Haring's "hams" (amateur radio enthusiasts) organized around technology use and established ethos through consensus in ways that had important consequences to technological meanings. Scholars have also shown that users can also influence technological development and significance by exercising their power as consumers, sometimes in unintended ways.[21] Embedded in these processes are assertions of who should use a given technology, and for what purpose.[22]

I investigate the user experience through fan publications written in the early 1980s. The International Center for the History of Electronic Games houses a complete archive of *Arcade Express* and *Electronic Games*, the first two video game periodicals

[20] Kristen Haring. *Ham Radio's Technical Culture* (Cambridge: MIT Press, 2007); Susan Douglas. *Listening In: Radio and the American Imagination* (New York: Times Books, 1999).

[21] See, for example, Ronald Kline. *Consumers in the Country: Technology and Social Change in Rural America* (Baltimore: Johns Hopkins University Press, 2000); Nelly Oudshoorn and Trevor Pinch, eds. *How Users Matter: The Co-Construction of Users and Technology* (Cambridge: MIT Press, 2003).

[22] Langdon Winner. *The Whale and the Reactor: A Search for Limits in an Age of High Technology* (Chicago: University of Chicago Press, 1986).

written by users and intended for users. I analyze their content to inform user priorities, opinions, and concerns. I obtained additional "strategy guides," or books written by users providing advice on how to achieve higher scores on a given game or games, through independent book sellers. Most contain sections that describe community behavior, etiquette, user demographics, and the impetus for play. Additional insights are gained through producer and mediator analyses of user trends and behaviors, especially as observed by the operators of video arcade game spaces.

To date the history of video arcade games has been written primarily by enthusiasts.[23] There have been few disciplined historical studies of video arcade games. Henry Lowood's "Videogames in Computer Space: The Complex History of *Pong*" stands out as an exemplary history of early design, but is limited to a few games at the dawn of the industry. Other histories, such as Nick Montfort and Ian Bogost's *Racing the Beam* and Martin Campbell-Kelly's *From Airline Reservations to Sonic the Hedge Hog*, address the history of video games but are almost entirely concerned with home consoles.[24] This dissertation therefore provides a critical narrative that is presently lacking.

Given the relative dearth of academic secondary sources, at times I draw upon the work of fans and journalists. Historians are often hesitant to utilize such 'amateur' histories to produce academic narratives, and rightly so, given that the lack of

[23] Van Burnham, ed. *Supercade: A Visual history of the Videogame Age, 1971-1984* (Cambridge: MIT Press, 2001); Scott Cohen. *Zap! The Rise and Fall of Atari* (New York: McGraw-Hill, 1984); Marty Goldberg and Curt Vendel. *Atari, Inc.: Business is Fun* (Carmel: Syzygy Company Press, 2012).
[24] Martin Campbell-Kelly. *From Airline Reservations to Sonic the Hedgehog: A History of the Software Industry* (Cambridge: MIT Press, 2003); Nick Montfort and Ian Bogost. *Racing the Beam: The Atari Video Computer System* (Cambridge: MIT Press, 2009).

disciplinary standards calls the information they contain into question. However, in the case of video games journalists and fans have been producing valuable chronicle that cannot be ignored if a robust history is to be achieved. As argued by Raiford Guins,

> Such works demonstrate that game history is constructed by a diverse range of sources that are well outside of 'official' academic resources and closer to the massive information repositories of Atari Age and Moby Games – enthusiasts, antiquarians, collectors, hobbyists… 'amateur' historians who have been laboring over the histories of games much longer than academics have.[25]

Erkki Huhtamo notes that such works are "mainly concerned with amassing and organizing data" and do not develop "a critical and analytic attitude towards (their) subject."[26] I synthesize the data they present to inform a critical analysis and fill gaps in the archival record. I pay special attention to published interviews with principal figures in books such as Steven Kent's *Ultimate History of Video Games* and Morgan Ramsay's *Gamers at Work*.[27] Kent's work is particularly valuable because, as praised by Guins, it features "expansive interviews with game industry insiders."[28] The book is organized around the extensive use of large block quotes, and is therefore a repository of first-hand accounts.

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[25] Raiford Guins. *Game After: A Cultural Study of Video Game Afterlife* (Cambridge: MIT Press, 2014), p. 24.
[26] Erkki Huhtamo. "Slots of Fun, Slots of Trouble: An Archaeology of Arcade Gaming," in Joost Raessens and Jeffrey Goldstein, eds. *Handbook of Computer Game Studies* (Cambridge: MIT Press, 2005), p. 4.
[27] Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001); Morgan Ramsay. *Gamers at Work: Stories Behind the Games People Play* (New York: Apress, 2012).
[28] Guins, p. 24.

Methods and Theories

My foundational assertion is that video arcade games were defined by the combined actions and interactions of producers, mediators, and users. Each of these three categories of actors describes a series of (non-exclusive and frequently porous) roles and actions that influence technology. Viewing them together displays a robust history of video arcade games, and important aspects of that history only become clear through examining the perspectives and experiences of all three groups. My chief historiographical contribution is therefore in combining producers, mediators, and users in an integrated analytical framework.

My approach is novel because I give roughly equally treatment to each role. Previous works such as Susan Douglas' *Inventing American Broadcasting*, Philip Scranton's *Endless Novelty*, and JoAnne Yates's *Structuring the Information Age* have included producers, mediators, and users in their narratives without the explicit identification of categories, but place primary emphasis on one or two roles.[29] Such studies benefit from the inclusion of multiple actor perspectives within a given system of technical, social, and economic relationships. However, to date the overwhelming majority have been more interested in elucidating particular aspects of technology than in

[29] Douglas is more focused on producers (inventors of radio) and mediators (governmental forces, marketers, and the press) than users. Amateur users are an important part of her story, but receive lesser attention by comparison. Both Scranton focuses primarily on producers, with mediating institutions and user needs reflected through producer experiences. Yates concentrates on user influences, but includes discussions of producers and institutional mediators. Susan Douglas. *Inventing American Broadcasting, 1899-1922* (Baltimore: Johns Hopkins University Press, 1989); Philip Scranton. *Endless Novelty: Specialty Production and American Industrialization, 1865-1925* (Princeton: Princeton University Press, 1997); JoAnne Yates. *Structuring the Information Age: Life insurance and Technology in the Twentieth Century* (Baltimore: Johns Hopkins University Press, 2005).

exploring how the actions and interactions of each actor category influence technological development and meaning.

The work that most closely resembles my own is Regina Blaszcyzk's *Imaging Consumers*. Her analysis of the glassware and china industries prominently features producers such as Corning Glass and the Kohler Company. It is significantly deepened through the identification of "fashion intermediaries" as "astute consumer liaisons" that generated, reacted to, and anticipated consumer desires.[30] Blaszcyzk also pays careful attention to the users of consumer products and recognizes their potential to affect technological systems through their purchasing practices. By identifying producers, mediators, and users as equally valid historical actors, Blaszcyzk gains a valuable perspective on "mass-market artifacts" that leads her to refute the usual emphasis on "elite objects" in the history of design.[31] The total work demonstrates that the intricacies of the "relationship between producers and their audiences" only become clear when viewing multiple sides of the exchange.[32]

My analysis builds on Ruth Schwartz Cowan's concept of the "consumption junction," defined as "the place and time at which the consumer makes choices between competing technologies."[33] A focus on consumption "brings into relief" "the variables that have governed the behavior of all those relevant social groups who influence

[30] Blaszczyk, p. 12.
[31] Blaszczyk, p. 273.
[32] Blaszczyk, p. 272, 275.
[33] Ruth Schwartz Cowan. "The Consumption Junction: A Proposal for Research Strategies in the Sociology of Technology," in Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch, eds. *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge: MIT Press, 1987), p. 263.

consumers' choices."[34] In the case of video arcade games, both mediators and users served as consumers at different levels of the economic process. Mediators chose which games to buy from producers, and users chose which games to play in mediator-created video arcade game spaces. As pointed out by Cowan, investigating these technology choices not only indicates some of the intricacies and rationales of adoption, but can also "shed important light on invention, innovation, development, and production."[35]

I also draw on recent works by Josh Greenberg and Ruth Oldenziel et al. that explore the role of mediators in the consumption junction. Greenberg persuasively argues that "mediators shaped that consumption junction in which consumers encountered a mass consumer technology, establishing a broader dialogue (and eventually, consensus) on its meaning."[36] My findings support this claim, and show that mediators defined much of the context for technology use. As pointed out by Oldenziel et al., mediators can also affect technology through the "mediation junction," defined as instances when "social actors articulated and aligned product characteristics and user requirements to mediate between the realms of production and consumption."[37] They argue that investigating this relationship "opens up the question of the parameters of the power relations at this mediation junction and therefore the particular paths taken by technological developments."[38] Oldenziel et al. are primarily concerned with governmental and institutional mediators, but I have found that their ideas can be constructively applied to

[34] Cowan, p. 255.
[35] Cowan, p. 278-279.
[36] Greenberg, p. 155.
[37] Ruth Oldenziel, Adri Albert de la Bruhèze, and Onno de Wit. "Europe's Mediation Junction: Technology and Consumer Society in the 20th Century." *History and Technology: An International Journal*, Vol. 21, No. 1, 2006, p. 111.
[38] Oldenziel et al., p. 114.

show how the choices of economic mediators influence the form and function of technology.

By demonstrating the importance of mediators in the history of video arcade games, I argue that they should hold a greater place in historiography. The history of technology has traditionally been focused upon technology creation, identifying the who, what, where, and how of important innovations. Over roughly the past two decades it has expanded significantly to include the use of technology.[39] This shift is welcome, but still leaves a gap in our understanding. Technologies do not spring directly from engineering laboratories to consumers. They first pass through a series of mediations (political, economic, legal, institutional, etc.) that contribute to their technical and social characteristics. These mediations have consequences, and are important to the history of technology.

To the extent possible, I apply a "multiscalar analysis" in which "micro-scale actors interact with meso-scale institutions" against a backdrop of macro-scale social and cultural forces.[40] As explained by Paul Edwards, "different scalar views" lead to "different pictures" of how technological systems develop and how they exert "constraining and enabling effects on social and individual life."[41] For the most part, my analytical categories lend themselves to meso-scale aggregates within industries and communities. They best describe group behavior as presented by the total body of sources

[39] Nye (2006), p. 56-59; Carroll Pursell. *The Machine in America: A Social History of Technology* (Baltimore: Johns Hopkins University Press, 1995).
[40] Paul Edwards. "Infrastructure and Modernity: Force, Time, and Social Organization in the History of Sociotechnical Systems," in Thomas J. Misa, Philip Brey, and Andrew Feenberg. *Modernity and Technology* (Cambridge: MIT Press, 2004), p. 222.
[41] Edwards, p. 220-221.

surveyed. However, they are constructed from micro-level accounts, and take place (especially during the Golden Age) against a backdrop of video arcade games as a macro-level cultural entity. Adopting a multiscalar approach allows me to create a more complete account from available sources.

Summary of Chapters

Chapter one, "Video Arcade Games," is an overview social history of the technology. It provides background information for the chapters that follow, and addresses some aspects of the history of video arcade games that fall outside of the specific viewpoints of producers, mediators, and users. Part one, "Precursors," discusses coin-op amusement technologies, such as pinball machines and electromechanical novelties, and computer hacking as the social and technological antecedents of video arcade games. Part two, "1971: The First Video Arcade Games," tells the story of the first two video arcade games, *The Galaxy Game* (1971) and *Computer Space* (1971). Part three, "1972-1978: The *Pong* Boom and Bust," details the creation of *Pong* (1972), its subsequent popularity, the birth of the video game industry, and its decline in the mid-1970s. Part four, "The Golden Age," describes the era of peak video arcade game popularity that lasted from 1979 to 1983. It tracks the revival of the American video game industry following the introduction of *Space Invaders* (1978), the sudden rise in video arcade game popularity after its release, expansion into new spaces, and the formation of user communities. Part five, "The North American Video Game Crash of 1983," examines how design stagnation, market saturation, and a "moral panic"

contributed to the decline of video arcade games. It describes the progression of the crash, and how it changed the video game industry. Part six, "A Different Technological Paradigm," looks at the aftermath of the crash and the technological, economic, and cultural transition away from video arcade games and towards home video games.

Chapter two, "Producers," presents the history of video arcade games from the perspective of developers, management, and other assorted business personnel, as well as the manufacturer institutions that supported them. Part one, "Distilling the Producer Perspective," gives an overview of primary sources, defines boundaries, and gives a basic description of producers, including educational background and typical demographics. Part two, "Envisioning Video Arcade Games," contrasts initial visions for video arcade game design and economics at Atari with actual paths of technological development. It demonstrates that forming an industry and establishing technological models was a highly contingent process. Part three, "A New Technology, an Old Industry" examines how Atari developed and positioned their products in relation to pre-existing technologies, perceptions, and practices in coin-op amusement industry. Part four, "Business Practices and Models at Atari," considers how Atari's approaches at the dawn of the industry established industry models for manufacturing and innovation. Part five, "The Video Game Industry," looks at the expansion of the video game industry and its ramifications on technological development and public perceptions. It also examines how corporate cultures at Atari and other producers helped to define who video games were for. Part six, "The Decline of Video Arcade Games," tracks the decline of video arcade

games as technological paradigm and the role of Atari management in causing the 1983 crash.

Chapter three, “Mediators,” investigates the history of video arcade game operators and distributors. Part one, “Distilling the Mediator Perspective,” discusses sources, describes the roles of distributors and operators, and indicates how they functioned within the larger coin-op amusement industry. Part two, “Distributing and Operating Video Arcade Games,” describes initial mediator reactions and approaches to video arcade games. Part three, “Mediators and Market Feedback,” demonstrates how mediators affected technological trajectories through their priorities and purchasing practices. Part four, “The Height of the Market,” views mediator actions during the Golden Age. It analyzes how and why mediators constructed video arcade game spaces, and how their decisions affected use, meaning, economics, and moral panic concerns. Part five, “Retrenchment,” deals with how mediators reacted to the 1983 crash by turning away from video arcade games and back to more traditional coin-op amusements.

Chapter four, “Users,” tells the history of video arcade games from the user perspective. Part one, “Distilling the User Perspective,” lists sources, explains their limitations, and gives an overview of user demographics. Part two, “Users and the Market,” describes reasons for play, how they manifested in the economy of the arcade, and why at times they put users and mediators at odds. Part three, “Gamer Communities,” analyzes how and why gamer communities formed. It also considers their social dynamics to indicate how gamers generated hierarchies that both reflected and influenced user demographics. Part four, “Users and Non-Users,” investigates the competing

meanings put forth by users and non-over the significance, value, and moral aspects of video arcade games. Part five, “From Arcades to Homes,” looks into how use changed when the technological paradigm for video games shifted from video arcade games to home gaming.

My dissertation concludes with chapter five, “Defining Play.” It begins by summarizing the role of producers, mediators, and users in the history of video arcade games and highlights their most important contributions. It moves on to situate “The History of Video Arcade Games in the History of Computing.” Finally, in “The History of Video Arcade Games in the History of Technology” I discuss the history of video arcade games in relation to historiographical questions and methods.

Chapter One - Video Arcade Games

To understand the history of video arcade games from the perspective of producers, mediators, and users requires knowledge of the basic social history of the technology. With that in mind, this chapter provides a chronology of the antecedents, early iterations, spread, and decline of video arcade gaming from its pre-history to 1985. It is not a detailed technical history chronicling the ins and outs of various chips, display types, and internal circuitry. Such a narrative falls outside of the scope and goals of this work.[1] Rather, it is a history of design philosophies and broad industry trends, of technology creation, proliferation, and reception. Its goal is to provide background information for the analytical chapters that follow, and also to address aspects of the history of video arcade games that do not specifically fall into a producer, mediator, or user viewpoint. All three categories of actors appear in brief, but are covered in greater detail in later chapters.

I draw from primary sources, especially various business records of Atari, Inc., as well as journalistic and fan histories to give a multi-dimensional account of video arcade games. Fragments of the narrative are found in various secondary sources, but no one work brings them together into a cohesive history. Stephen Kent's *Ultimate History of Video Games* comes closest to a cohesive history and is admirable for its extensive interviews with principal actors.[2] However, it pays minimal attention to the role of mediators and users and neglects important factors that contributed to the 1983 North

[1] For a more internalist and technical history of video arcade games, see Ralph H. Baer. *Videogames in the Beginning* (Springfield, NJ: Rolenta Press, 2005).
[2] Stephen L. Kent *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

American video game crash. It does not adopt a critical approach, and is therefore pays little attention to why video arcade games developed certain technological, economic, and social characteristics. Other journalistic sources, such as Scott Cohen's *Zap! The Rise and Fall of Atari*, are less thorough and generally more focused on interesting anecdotes rather than historical accuracy.[3] Antiquarian chronicles, such as Curt Vendel and Marty Goldberg's *Atari, Inc.: Business is Fun* or Van Burnham's *Supercade*, provide valuable information but are too narrow in scope to inform an overview social history.[4] A few academic sources, most notably Henry Lowood's "Video Games in Computer Space: the Complex History of *Pong*," thoroughly investigate certain aspects and events but do not aim at an overarching narrative.[5] This chapter therefore presents a necessary overview history of video arcade games that is otherwise unavailable.

Part One - Precursors

The two primary technological precursors to video arcade games were coin-operated (coin-op) amusement devices (mainly pinball machines and electromechanical novelties) and computer hacks (defined by Leslie Haddon as "stylish technical innovations" created using a computer and "undertaken for the intrinsic pleasure of

[3] Scott Cohen. *Zap! The Rise and Fall of Atari* (New York: McGraw-Hill, 1984).
[4] Van Burnham, ed. *Supercade: A Visual history of the Videogame Age, 1971-1984* (Cambridge: MIT Press, 2001); Marty Goldberg and Curt Vendel. *Atari, Inc.: Business is Fun* (Carmel: Syzygy Company Press, 2012).
[5] Henry Lowood. "Video Games in Computer Space: The Complex History of Pong." *IEEE Annals of the History of Computing*, Vol. 31, No. 3, July-September, 2009; Joost Raessens and Jeffrey Goldstein, eds. *Handbook of Computer Game Studies* (Cambridge: MIT Press, 2005); Nick Montfort and Ian Bogost. *Racing the Beam: The Atari Video Computer System* (Cambridge: MIT Press, 2009), p. 121; Mark J.P Wolf, ed. *B*efore *the Crash: Early Video Game History* (Detroit: Wayne State University Press, 2012.

experimenting – not necessarily fulfilling any more constructive goal").[6] Though radically different, the two technological traditions converged in video arcade games.[7] Coin-op amusements provided social and technological models that informed video arcade game design, economics, and culture. *Spacewar!* (1962), the first video game, was a computer hack and the forbearer of the first video arcade games.

Coin-Op Amusement Devices

Coin-operated amusement devices predated video arcade games by many years. Basic coin-op technology, or technological processes set in motion by the insertion of a coin into a given machine, had appeared in vending machines since at least the early 1600s.[8] As mechanization spread in the 1800s, inventors applied coin-op technology in products that sold experiences rather than goods. By 1880 there were a great variety of coin-op amusements, including gambling devices, strength testers, fortune telling machines, electric shock machines, viewing machines (with pictures or mechanical theater), listening machines, and shooting galleries.[9] They were popular pastimes and proliferated widely "in all imaginable public places: street corners, bars, newsstands,

[6] Leslie Haddon. "The Development of Interactive Games," in Hugh Mackay and Tim O'Sullivan, eds. *The Media Reader: Continuity and Transformation* (London: SAGE Publications, 1999), p. 307.
[7] Television technologies were important components of video arcade games and a major engineering concern, but served as a means of implementation rather than inspiration. As argued by Henry Lowood, *Pong* (1972), the first hit video arcade game, was "a product inspired by computer technology but practically realized by TV technology." Video arcade games also drew upon a host of design elements from other sources. As described by Mark J.P. Wolf: "Title screens, credits, screen-to-screen cutting and conservation of screen direction (exit left, enter right, and vice versa) were all borrowed from cinema; other conventions and technologies were adapted from interactive interfaces like car dashboards, airplane instrument panels, and submarine or tank periscopes." However, none of these elements were as formative as coin-op amusement devices or computer hacks. Lowood, p. 17; Mark J.P. Wolf "Introduction," in Wolf, ed., p. 3-4
[8] Kerry Segrave. *Vending Machines: An American Social History* (Jefferson: McFarland & Co., 2002), p. 4.
[9] Erkki Huhtamo. "Slots of Fun, Slots of Trouble: An Archaeology of Arcade Gaming," in Raessens and Goldstein, eds., p. 6-7.

department stores, hotel lobbies, waiting rooms at railway stations, amusement parks, seaside resorts, and trade fairs."[10] They tended to be flashy and noisy, and those that were games (as opposed those that provided passive or non-competitive experiences) sometimes incorporated scoring mechanisms to reflect player skill.[11]

Early coin-op amusements were most prominently featured in "penny arcades," or spaces devoted to the display and use of coin-op technologies. The business model appeared in New York around the turn of the 20th century and quickly spread to other major urban areas along the eastern seaboard and Great Lakes. The most notable examples were designed to awe patrons with a spectacle of lights, sounds, and options for play.[12] In his history of public amusements, David Nasaw described Automatic Vaudeville (fig. 1-1), a prominent penny arcade on 14th street in New York City:

> Inside, the long narrow arcade extended a block south to 13th street. It was lit with chandeliers and hundreds of large white-frosted bulbs; the floor jammed with the latest and most luxurious collection of automatic coin-in-the-slot machines available anywhere. For the sporting crowd, there were punching bags to compare your punch… shooting-gallery rifles; weights to pull; hammers to pound; stationary bicycles and hobby-horses. There were also automatic amusement machines that dispensed cards with your fortune, your horoscope, or your future wife's picture; metal embossers that spit out "Your Name in Aluminum"; "automatic" gum, candy, and peanut machines; coin-in-the-slot phonographs… and more than 100 peep-show machines.[13]

[10] Huhtamo, p. 6.
[11] Geoffrey R. Loftus and Elizabeth F. Loftus. *Mind at Play: The Psychology of Video Games* (New York: Basic Books, 1983), p. 7.
[12] David Nasaw. *Going Out: The Rise and Fall of Public Amusements* (New York: Basic Books, 1993), p. 154.
[13] Nasaw, p. 157.

Figure 1 - 1: Interior of Automatic Vaudeville, ca. 1904. The Museum of the City of the New York. http://collections.mcny.org/Collection/Automatic%20Vaudville.-2F3XC5JD16V.html (accessed 5/14/15)

Penny arcades were public amusement centers built around casual play and novelty.[14] Coin-op industry journalist Ed Adlum later recalled that "by in large, you didn't go into an arcade in those days to play a specific game. You went into the arcade to go into the arcade."[15] Coin-op amusement technologies were mostly designed for young, working class men. Shooting formed a major segment of the industry. Notable examples of the genre include *Shoot the Bear* (1949), where players used an optomechanical a rifle

[14] Nasaw, p. 158.
[15] Ed Adlum, as quoted in Kent, p. 10.

equipped with a light beam to shoot targets on a moving electromechanical bear (fig. 1-2), and *Six Shooter* (1950), a quick-draw simulator against a life-sized electromechanical cowboy.[16] Physical games that measured punching power, grip strength, or other physical capabilities were common attractions. "Peep-shows" or "kinetoscopes" were popular and, despite modern connotations, displayed moving pictures on a variety of subjects.[17] Some were risqué (though rarely pornographic) and attracted a clientele of young men and boys. Nasaw writes, "As a visitor to Samuel Swartz's arcade on S. Clark Street in Chicago observed, the sign reading ''For men only' attracts the small boy like a magnet.' Because so many of the boys who gathered around the muto-scopes [a type of peep show] were not tall enough to reach the eyehole, arcade managers had to supply them with stools to stand on." [18] The penny arcade was a masculine space catering to an assumed core demographic of men with social autonomy and disposable income. Only a small minority of coin-op amusements were designed for women or couples.[19] Because games were noisy and gaudy they were also associated with working class people with money to spend on trivial amusements but without the sophistication of the wealthy.

Decades following the proliferation of penny arcades and coin-op amusements, pinball machines became the technology most associated with coin-op. The first pinball

[16] In his interview with Stephen Kent, Ed Adlum misremembers the names of both machines: calling *Shoot the Bear* "Seeburg Bear Gun" and *Six Shooter* "Six Gun." Kent, p. 10.
[17] Nasaw, p. 135, 159.
[18] Nasaw, p. 154.
[19] Indeed, "penny arcades attracted a socially mixed crowd, including women." However, this was counter to social norms and proscriptions that deemed the spaces "unsuitable" for women. It can be safely assumed that women were a minority demographic and that those did enter were in all likelihood willing to "disregard reproaches." Huhtamo, p. 13-14.

Figure 1 - 2: Tagline reads: "Shoot the Bear! It's legal… it's fun!" "*Shoot the Bear*." Sands Mechanical Museum. http://www.sandsmuseum.com/coinop/games/bear/shootbearad2.jpg (accessed 5/14/15). Cropped for space.

machine was developed by David Gottlieb, "a showman and inventor," in 1931.[20] His *Baffle Ball* (1931) was entirely mechanical.[21] It consisted of a plunger, seven balls, and eight "pockets" created by a circle of stationary pins. Players launched seven balls for a penny, manipulated the trajectory of the ball by moving the entire cabinet, and kept their own scores. Despite its simplicity, the game was remarkably successful. Gottlieb founded a coin-op amusement company (which he named after himself) in Chicago and launched

[20] There is remarkably little biographical information on David Gottlieb. Stephen Kent provides a description based on interviews with Gottlieb's descendants: "David Gottlieb was a short, stocky man with a full head of brown hair and an ever-present cigar in his mouth. A showman and an inventor, he once made a living by taking carnival games to oil workers in remote Midwestern oil fields. He understood the balance of chance and skill that made games fun and had a talent for refining ideas to make them more fun." Kent, p. 2.

[21] *Baffle Ball* lacked several of the foundational technological features of later pinball machines, including flippers, bumpers, scoring mechanisms, and conditional goals.

Baffle Ball as its flagship product. During the peak of its popularity, Gottlieb sold 400 *Baffle Ball* machines per day.[22] Imitators quickly followed, and within a few years Chicago developed a prominent pinball manufacturing cluster.

The three largest pinball manufacturers were based in Chicago, and were Gottlieb, Bally, and Williams. Bally was founded in 1932 by Raymond Moloney to manufacture the popular pinball machine *Ballyhoo* (1932). Harry Williams, a Stanford-educated engineer, partnered with Pacific Manufacturing in Los Angeles to introduce the first "tilt" mechanism (a technological feature that ended a game prematurely if a machine was moved too much during play, a feature "present in nearly every pinball game" since its introduction) in 1931, and the first electromechanical pinball machine in 1933. Williams founded his own company in Chicago in 1944.[23]

Pinball machines and other coin-op amusement technologies pioneered technical models, business practices, and public expectations that shaped video arcade games and the experience of play, as I will show later chapters.[24] Pinball was especially influential due to design and play similarities, and because several major pinball manufacturers later branched out into video games.[25] Bally licensed and manufactured *Space Invaders* (1978), *Pac-Man* (1980), *Galaga* (1981), and a host of other hit video arcade games, often through its Midway subsidiary. Williams became a manufacturer of video arcade

[22] Kent, p. 3.
[23] Kent, p. 3-4.
[24] See, for example, chapter two, "Video Arcade Games and Other Coin-op Amusements," and "Imitation as Common Practice;" chapter three, "Crafting Video Arcade Game Spaces;" and "Buying Video Arcade Games."
[25] Similar to video arcade games, pinball machines had to be carefully calibrated to provide a balance of challenge and reward, luck and skill. They had to simple enough for a novice to play, intricate enough to maintain the interest of seasoned players, and difficult enough that players were required to regularly input coins. See, for example, Loftus and Loftus, p. 20-21.

games in the early 1980s and released several popular titles including *Defender* (1980) and *Joust* (1982). Gottlieb stuck to pinball machines early on but entered into the video arcade game industry in 1982, producing the hit *Q*Bert* (1982).

The penny arcade formed the institutional and cultural basis for the video arcade. The design, spatial layout, and social dynamics of the two spaces were similar enough to show clear lineage (see chapters three and four). The masculinity of penny arcades influenced later coin-op amusement spaces. The preponderance of young men, "risqué" coin-op amusements, working class clientele, and urban location of penny arcades cast them as somewhat seedy, low-brow establishments. As discussed later, these associations haunted the coin-op industry, and were an issue for video arcade game producers, mediators, and users.[26]

Pinball machines and coin-op amusements were common in urban centers but were, by and large, not acceptable in other spaces. The noise and spectacle that made pinball machines and other coin-ops effective when placed in penny arcades were a distinct liability in quieter, more sophisticated locations. Associations with working class leisure and the bawdy content of some peep-show machines created additional social barriers. With notable exceptions, coin-op amusements were also limited economically because they relied upon perpetual novelty and hence had fleeting viability in the marketplace. They needed large populations and quick machine turnover, which created sizeable overhead costs and restricted their geographic distribution to densely populated urban areas.

[26] See Chapter One, "Moral Panic;" Chapter Two, "Video Games under Fire;" Chapter Three, "Public Resistance;" Chapter Four, "Non-Users and Moral Panic."

Associations to organized crime created additional barriers for pinball machines. In the mid-1930s some manufacturers turned pinball machines into gambling devices that offered "payouts" for successful play. Payout pinball machines occupied a legal gray area that allowed them to circumvent anti-gambling laws. Organized crime quickly utilized payout pinball machines in pre-existing gambling dens and used them to tap new markets. Because the coins placed in individual coin-op machines were difficult to track, mob bosses integrated them into a system of money laundering. Due to these associations, pinball became a criminal technology in the eyes of the public (fig.1-3).

Eventually restrictions on pinball machines, even those without payouts, were enacted by local governments. The most famous instance occurred in New York City, where Mayor Fiorello LaGuardia petitioned local courts in the mid and late 1930s to make pinball machines illegal as part of his fight against organized crime (fig. 1-4). His campaign was well publicized in newspapers and newsreels.[27] Joel Hochberg, who worked as both a video arcade game producer and mediator, later recalled "There was a gaming [gambling] connotation to the coin-operated amusement business. There was a photograph I remember very clearly – Fiorello LaGuardia, the mayor of New York City, by the waterside breaking up all these "games of chance" and throwing them into the sea

[27] Huhtamo, p. 14; Joel Hochberg, as quoted in Kent, p. 5.

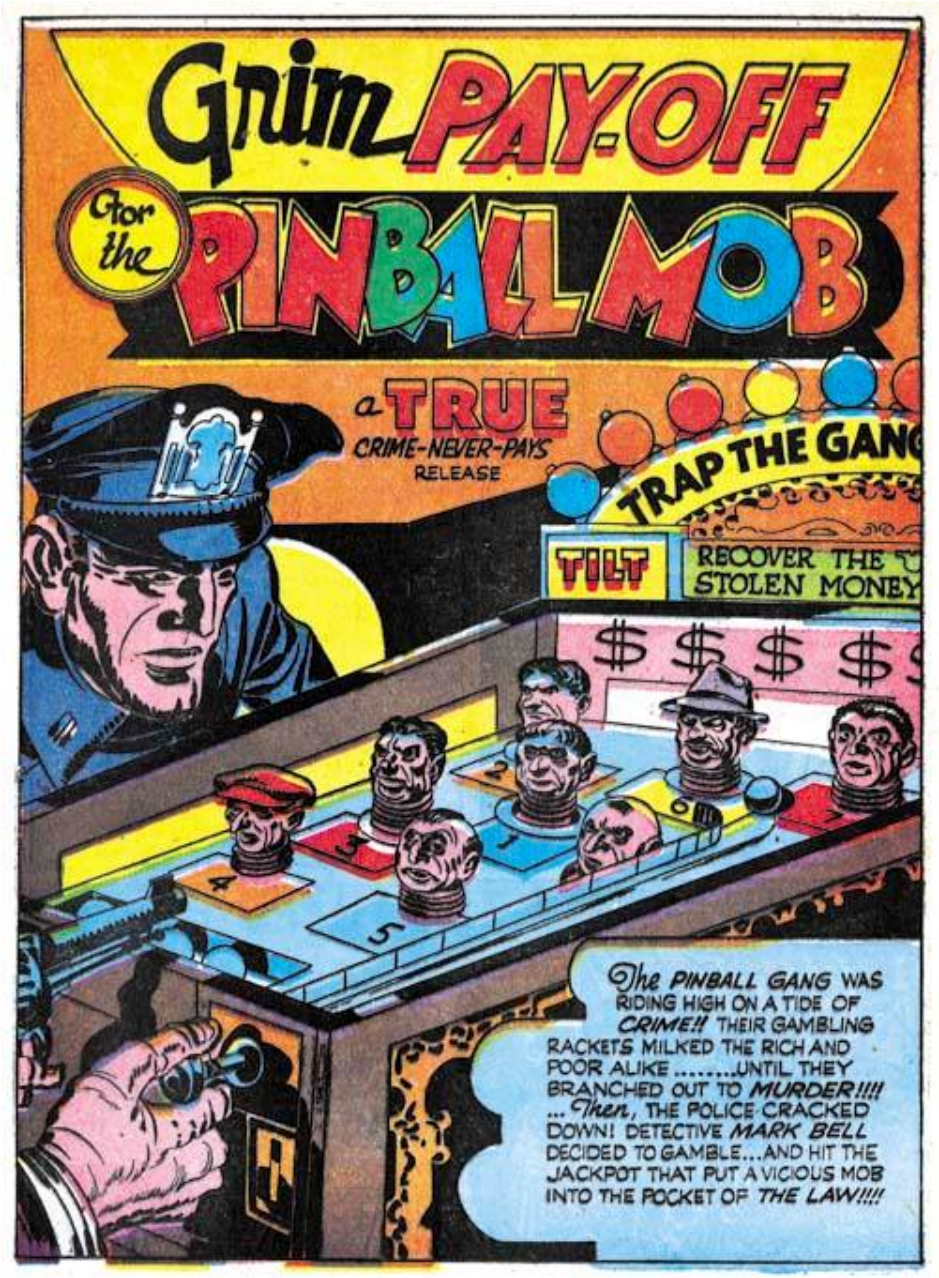

Figure 1 – 3: A 1947 Jack Kirby comic book characterizing pinball machines as gambling devices utilized by organized crime. Bottom right caption reads "The pinball gang was riding high on a tide of crime!! Their gambling rackets milked the rich and poor alike… until that branched out to murder!!!! … Then, the police cracked down! Detective Mark Bell decided to gamble… and hit the jackpot that put a vicious mob into the pocket of the law!!!!" "Grim Pay-off for the Pinball Mob," *Headline Comics*, Vol. 2, No. 12, May 1947. The Jack Kirby Museum. http://kirbymuseum.org/blogs/simonandkirby/wp-content/uploads/sites/2/2011/01/H24PinBallMob001.jpg (accessed 5/22/15)

Figure 1 - 4: New York City Mayor Fiorello LaGaurdia tipping over a pinball machine, ca. 1938. The Jack Kirby Museum. http://kirbymuseum.org/blogs/simonandkirby/wp-content/uploads/sites/2/2011/01/LaGuardia1.jpg (accessed 5/15/2015)

to dispose of them."[28] LaGuardia's campaign succeeded in 1942 when pinball was made illegal in New York City. Law enforcement seized more than 3,000 machines and turned them into scrap metal for the war effort.[29] There is little evidence that prohibitions on pinball machines got rid of the machines in a given municipality, but it did drive them underground into criminal areas and reinforced social taboos.

[28] Kent implies that these "games of chance" were pinball machines, but photograph records suggest they were probably slot machines. Hochberg, as quoted in Kent, p. 5; "LaGuardia smashing slot machines with a sledge hammer on North River barge." New York City Department of Records. http://nycma.lunaimaging.com/luna/servlet/view/all/what/Crime/LaGuardia,+Fiorello+H.?sort=Identifier%2CDate%2CDecade%2CCreator (accessed 5/25/15)

[29] Kent, p. 6.

Computer Hacks

The first video game was created by The Tech Model Railroad Club (TMRC) at the Massachusetts Institute of Technology (MIT). Arguably the first hacker group, TMRC was originally founded in 1947 by enthusiasts of model railroads.[30] The club attracted tinkerers and engineers that built a complex electromechanical train simulator, called "The System," that became central to its culture. TMRC members had a reputation for being odd, creative, and a bit roguish.[31] The club originated the term "hack" in the engineering sense. Though its exact meaning is ambiguous even in TMRC writings, a "hack" generally described finding unorthodox uses for existing technologies. The practice was integral to TMRC. Members raided the storerooms of MIT for technological equipment and parts. The practice earned them the nickname 'The Midnight Requisitioning Committee.'[32] On one such foray in 1959, TMRC member Peter Samson discovered an unattended IBM 407. Though more of an accounting machine than a computer per se, it was able to both read and create punch cards of programmed computer processes. TMRC jury-rigged the IBM 407 with a control panel and used it to

[30] There is some question over the first video game. Mathematical games, game-like simulations, and attempts at chess had been built on computers since the early 1950s. A few (though not many) used graphics displays. "Tennis for Two," created on an oscilloscope by physicist William Higinbotham in 1958, is sometimes cited as the first video game. However, it only operated at Brookhaven National Laboratory for a single weekend and had little lasting technological impact. Steve Russell, inventor of *Spacewar!* and arguably the father of the video game, explained : "There's some question about how you define a computer game. Two interactive programs existed before *Spacewar!*, in which you interacted with switches on the computer and you changed a display on the screen, depending on what you did with the switches. But they weren't particularly designed as games. And they weren't very popular because, as games, they weren't very good." Burnham, p. 28; Kent, p. 18; Steve Russell as quoted in Kent, p. 15.
[31] Burnham, p. 39; Kent, p. 16.
[32] Burnham, p. 39.

dabble in programming. Its members also secured time on MIT's TX-O mini-computer and (to a lesser extent) IBM 709 mainframe computer.[33]

In the summer of 1961, TMRC learned that Digital Equipment Corporation (DEC) was donating a Programmable Data Processor-1 (PDP-1) computer and a Type 30 Precision CRT display to MIT. Before its arrival, TMRC members J. Martin Graetz, Wayne Wiitanen, and Steve Russell, whose nickname was "Slug," brainstormed interesting hacks for the new hardware. They were particularly interested in creating a demonstration program that would showcase the capabilities of the new display. Someone floated the idea of a computer game involving spaceship combat, and the idea stuck.

Graetz, Wiitanen, and Russell called the idea *Spacewar!* The trio had a shared love for science fiction and reasoned that "space is easy to program because it's empty."[34] The concept drew from pre-existing simple computer games, such as *Tic-Tac-Toe* (1959), and rudimentary visual displays such as "Bouncing Ball" and Marvin Minsky's "Tri-Pos."[35] Nonetheless, nothing on the level of *Spacewar!* had ever been done. Russell volunteered to write the initial program. The project languished for months on the "excuse" that he didn't have the necessary sine and cosine routines.[36] However, the rest

[33] Kent, p. 17.
[34] I met Steve Russell at the California Extreme Classic Arcade Game Expo in 2013. He graciously invited me to play *Spacewar!* in its original form on a PDP-1 in an exhibit at the Computer History Museum. As we launched torpedoes at each other I asked him why he had chosen to develop a game based upon a science fiction theme. He grinned at me at said "space is easy to program because it's empty." Personal conversation with Steve Russell at the Computer History Museum, July 13, 2013. See also J.M. Graetz. "The Origin of *Spacewar!*" in Burnham, p. 42, 45.
[35] Lowood, p. 7.
[36] J.M. described that "Russell, never one to Do Something when there was an alternative, begged off for one reason or another. "One of the excuses for not doing it," Steve remembers, "was 'We don't have the sine-cosine routine and gee, I don't know how to write a sine-cosine routine…'" Graetz, p. 46.

of the TMRC was excited about the idea and pushed him to complete it. After fellow member Alex Kotok went to DEC headquarters and returned with the necessary programming subroutines, Russell started work in earnest.[37]

Russell completed a prototype of *Spacewar!* in late 1961 and a "finished version" in April of 1962 (fig. 1-5).[38] It was a two-player computer game featuring two rocket ships. "The Wedge" was "curvy like a Buck Rodgers 1930s spaceship," and "the Needle" was "very straight and long and thin like a Redstone rocket."[39] Players controlled their ship through a series of four switches: "One let you rotate counterclockwise, another was for rotating clockwise, one fired your rocket for thrust, and the last one fired your torpedoes."[40] The goal of the game was to hit the other player's ship with a torpedo before they hit you.

In many respects *Spacewar!* was more complex and impressive than most of the video arcade games that eventually followed it in the early 1970s. TMRC members made additions to the program that improved the display or added new gameplay elements. Peter Samson, who was "offended" by the random array of stars in the background, built a realistic star map for *Spacewar!* called the "Expensive Planetarium."[41] The program depicted the night sky between 22.5 degrees N and 22.5 degrees S as seen from Earth with a great deal of accuracy.[42] Later, Dan Edwards programed in a "heavy star" at the center of the map that exhibited a realistic gravitational pull, presenting both a hazard

[37] Burnham, p. 46; Steve Russell. Oral history by Al Kossow, Mountain View, California, August 9, 2008. The Computer History Museum, Mountain View, CA.
[38] Russell, as quoted in Kent, p. 18.
[39] Russell, as quoted in Kent, p. 19.
[40] Russell, as quoted in Kent, p. 19.
[41] Graetz, p. 46.
[42] Graetz, p. 46.

Figure 1 - 5: Tech-Model Railroad Club members Dan Edwards (left) and Peter Samson (right) playing *Spacewar!*, ca. 1962. The Computer History Museum. http://www.computerhistory.org/pdp-1/a87ddd9510aeebf6485c47a35f8a26aa/ (accessed 5/15/2015)

(space ships sucked into the sun were destroyed) and a strategy element as skilled players found ways to use the effects to their advantage.[43] Graetz developed a "hyperspace button" that when activated caused the player's ship to disappear and reappear at a random point on the screen with direction and velocity intact.[44] The additions made *Spacewar!* one of the more sophisticated interactive graphic programs in existence.

Spacewar! was an influential program. It was shared freely amongst computer enthusiasts, and Digital Equipment Corporation (DEC) started shipping it with the

[43] Graetz, p. 47.
[44] Graetz, p. 48.

machines as a test program for the PDP line of computers.[45] Copies spread from MIT to other university computer labs and industrial laboratories. Local communities of hackers made additional modifications to the code. As described by Henry Lowood, "Programmers everywhere added elements to the game or tweaked settings and controls in a local version… This convergence of competitive skill, programming wizardry, and collaborative community characterized hacker culture."[46] Many early video game pioneers received their introduction to game design and programming through *Spacewar!* Larry Rosenthal wrote an MIT master's thesis on *Spacewar!*, received a license from MIT to produce a commercial copy, programmed a vector graphics version entitled *Space Wars* (1977), and sold that game to video arcade game manufacturer Cinematronics (fig. 1-6).[47] It was a hit and established the company as an important player in the industry. Though *Spacewar!* was widely enjoyed, TMRC members gave little thought to turning it into a commercial product. *Spacewar!* was essentially an elaborate hack designed to push the limits of the PDP series of computers. It was designed as a piece technical exploration rather than a commercial product. Later accounts by TMRC members make clear that user experience was secondary to impressive and/or elegant feats of engineering.[48] Neither Russell nor the TMRC ever copyrighted *Spacewar!* It has been suggested that doing so would have violated the hacker ethic.[49]

[45] Lowood, p. 7.
[46] Lowood, p. 8.
[47] Tim Skelly. "The Rise and Fall of Cinematronics," in Wolf, ed., p. 141-142.
[48] See, for example, Graetz, p. 42-48; Russell, as quoted in Kent, p. 19; personal conversation with Russell, July 13, 2013.
[49] Kent, p. 20-21.

Figure 1 - 6: A *Space Wars* flyer from 1977. It promised "unprecedented realism" despite being a near copy of the 1962 version of *Spacewar!*. "*Space Wars*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=1043&image=1 (accessed 5/15/2015)

Perhaps more importantly, *Spacewar!* could only run on expensive computers owned by universities, corporations, and government institutions. It had some utility as a diagnostic application and was probably used by DEC as a selling point, but it did not a;waus fit the mission of the organizations that bought PDP computers. There was no commercial market for it. Russell recalled "We thought about trying to make money off [*Spacewar!*] for two or three days but concluded that there wasn't a way that it could be done."[50]

Part Two – 1971: The First Video Arcade Games

The technological trajectories of coin-op amusement machines and computer games converged in 1971 in *The Galaxy Game* (1971) and *Computer Space* (1971). Both proceed from the simple idea that *Spacewar!* was fun to play and popular in computer labs, and might make money as a commercial product. Both games were built in Silicon Valley near Stanford University and were released within two months of each other.[51] Both hybridized the technological traditions of computer hacks and coin-op amusements into single machines. However, *The Galaxy Game* was designed with greater fidelity to *Spacewar!*, and *Computer Space* with greater attention to the coin-op amusement industry. They represented two different technological trajectories for video arcade games. One succeeded, and one failed.

[50] Russell, as quoted in Kent, p. 20.
[51] *Computer Space* was notably field-tested in August and also displayed at a coin-op industry trade show in October, but its official release didn't come until November. *The Galaxy Game* was first installed in September.

The Galaxy Game

The Galaxy Game began with Bill Pitts, an undergraduate computer science major who entered Stanford University in 1964. Much in the vein of TMRC, Pitts had a habit of breaking into university buildings and exploring their steam tunnels.[52] One night in 1966 he arrived at the D.C. Power building with the intention of exploring its interior only to find it open and occupied by a group of students using a PDP-6. The computer was intended for graduate students working at the Stanford Artificial Intelligence Laboratory (SAIL) and typically closed to undergrads, but Pitts convinced lab director Les Earnest to let him work on the machine when it was unoccupied. Pitts later recalled "That resulted in my adjusting my schedule where I'd sleep during the day and go up there all night. For the next two years, I just thoroughly loved going up to the AI project, working there rather intensively."[53]

The SAIL PDP-6 gave Pitts the opportunity to play *Spacewar!* for hours. He had been introduced to the game previously, but had few opportunities to play due to the difficulty of securing time on Stanford university computers. SAIL was less crowded. The graduate students there had programmed a "*Spacewar!* mode" into the PDP-6 operating system that made the game easily visible and accessible.[54] It may have had extra mystique at SAIL because Steve Russell was by then a section head at the

[52] "Bill Pitts, '68: Creator of the *Galaxy Game*." https://alumni.stanford.edu/get/page/magazine/article/?article_id=53338 (accessed 11/10/14); Bill Pitts and Steve Russell. "*Galaxy Game*: the Story of the First Coin-op Video Game," California Extreme, Santa Clara, July 13, 2013.
[53] "Bill Pitts, '68: Creator of the *Galaxy Game*."
[54] "Bill Pitts, '68: Creator of the *Galaxy Game*."

laboratory.[55] Pitts invited Hugh Tuck, a friend from high school, to come out to the lab on occasion. While there, they often played *Spacewar!*

Unlike Russell and TMRC, Pitts and Tuck believed that there was money to be made off of *Spacewar!* Pitts remembers Tuck coming up with the idea of creating an arcade version of the game: "[Tuck] thought the game was great, I mean everybody did, and he said, wow, if we could build a coin-operated version of this, we could get rich."[56] In 1967 the idea did not appear feasible. *Spacewar!* ran on expensive computer technology, and seemed to be no way to make a coin-op version economically viable. Nonetheless, the idea stuck with Pitts. Three years later in 1970, after he had graduated and moved on to a job at Lockheed, DEC released the PDP-11 mini-computer with a low end model between $12,000 and $14,000.[57] The cost was low enough that Pitts thought it could run a coin-op version of *Spacewar!* and make a profit. Together with Tuck, who was by then working as a mechanical engineer, Pitts founded a company in June of 1971 called Computer Recreations, Inc. and set to work on creating a PDP-11 version of *Spacewar!* Pitts did the programming and electronics, while Tuck designed the casings.[58] The completed game cost $20,000 after a vector display, walnut cabinet display interface, coin-op components, and other parts were factored in.[59] The sum accounted for all of the

[55] Pitts and Russell were acquaintances at SAIL, but neither mentions having discussed *Spacewar!* together. Russell had recently left SAIL when Pitts and Tuck started work on *The Galaxy Game*. Pitts and Russell, July 13, 2013; Russell, August 9, 2008.
[56] "Bill Pitts, '68: Creator of the *Galaxy Game*."
[57] Pitts' recollection differs on the exact price, at one point remembering the cost to be $14,000 and twice remembering it to be $12,000. See: Bill Pitts. "The Galaxy Game," Computer History Exhibits, Stanford University, October 29, 1997. http://infolab.stanford.edu/pub/voy/museum/galaxy.html (accessed 11/10/14); Pitts and Russell, July 13, 2013; "Bill Pitts, '68: Creator of the *Galaxy Game*."
[58] Pitts, October 29, 1997.
[59] Lowood, p. 9; Pitts, October 29, 1997.

money Pitts and Tuck had for the company, much of it raised from Tuck's brothers and sisters.

Pitts and Tuck finished *The Galaxy Game* in September of 1971 and placed it in Stanford's student union (fig. 1-7). Because the computer hardware used to run it was too large for the room, Pitts and Tuck placed the PDP-11 in an attic above the space and ran a cable through the ceiling to the display.[60] Games cost 10¢ per play or 25¢ for three plays, and winning players were awarded a free game provided their ship still had fuel.[61] The game received immediate attention. Pitts remembered "The response we got initially was just incredible. People were packed around the machine continuously and standing on chairs trying to look over to watch. At that time, a game like that was just magical, to see these little things that you could steer and fire torpedoes."[62] Encouraged by the showing, Pitts and Tuck developed a second version with more player options, improved hardware, and fiber-glass cabinets (fig. 1-8).[63] The update was placed beside the original in June of 1972 and could support up to four players, allowing more users at once and bringing in more revenue.[64]

The Galaxy Game was a hybrid of computer and coin-op technology, but it was explicitly faithful to *Spacewar!*[65] Pitts and Tucks' work prioritized the final product, what might reasonably be called the "hack," over profitability. It ran on expensive hardware

[60] "Bill Pitts, '68: Creator of the *Galaxy Game*."
[61] Pitts, October 29, 1997.
[62] "Bill Pitts, '68: Creator of the *Galaxy Game*."
[63] Pitts and Russell, July 13, 2013.
[64] Pitts, October 29, 1997; "Bill Pitts, '68: Creator of the *Galaxy Game*."
[65] Pitts and Russell, July 13, 2013.

Figure 1 - 7: Students playing *The Galaxy Game* in Stanford's Student Union, 1977. The Computer History Museum. http://www.computerhistory.org/VirtualVisibleStorage/popup_image.php?base_name=102637003 (accessed 5/15/2015)

and yet was inexpensive to play. As Pitts later wrote in third-person, "Given the investment, perhaps Bill and Hugh were not the most astute of businessmen."[66] Because it was placed in a student union at a tech-conscious university, it played to a demographic that was probably more comfortable in computer laboratories than pinball parlors. It

[66] Pitts, October 29, 1997.

Figure 1 - 8: Refurbished version of the second *Galaxy Game* machine displayed at the Computer History Museum. The Computer History Museum. http://www.computerhistory.org/VirtualVisibleStorage/popup_image.php?base_name=102631030 (accessed 5/15/2015)

assumed a tech-savvy audience and included a variety of gameplay options so that players could toggle speed, gravitational pull, and other features. As described by Henry Lowood: "*The Galaxy Game* was faithful not only to *Spacewar*, but also to the player community (university students and computer engineers) and to the technical configuration (software code, vector displays, time-sharing, and so on) that produced it."[67]

[67] Lowood, p. 9.

Computer Space

In the mid-1960s Nolan Bushnell, an undergraduate at the University of Utah, also became enamored with *Spacewar!* An erratic, energetic student with a diverse set of interests, Bushnell developed an enthusiasm for coding and started showing up at the university computer lab. Though he officially had lab limited access as an undergraduate student, he was able to use the machines after befriending several graduate students.[68] It was there that he discovered computer games. He played *Spacewar!* "incessantly" throughout his education and, with the help of other students, created computer game versions of tic-tac-toe and a rudimentary chase game.[69]

Bushnell had an unusual combination of knowledge. The University of Utah was an influential center of computing and was, according to Arthur Norberg and Judy O'Neill, "especially influential in the birth and development of interactive graphics."[70] While there, Bushnell developed a basic competency in programming and earned a degree in electrical engineering. After graduating in 1968 he first tried to get an engineering job at Disneyland, but when no offer materialized he moved to Silicon Valley to work at Ampex, a company specializing in magnetic tape recording technologies.[71] Like Pitts and Tuck, he visited the SAIL lab for late-night *Spacewar!* sessions, gaining access through a friend.[72] His technical education and exposure to cutting-edge computer graphics coincided with an intimate knowledge of

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[68] Kent, p. 30.
[69] Nolan Bushnell, as quoted in Morgan Ramsay. *Gamers at Work: Stories Behind the Games People Play* (New York: Apress, 2012), p. 18; Nolan Bushnell, as quoted in Kent, p. 30.
[70] Arthur L. Norberg and Judy O'Neill. *Transforming Computer Technology: Information Processing for the Pentagon, 1962-1986* (Baltimore: Johns Hopkins University Press, 1996), p. 122.
[71] Burnham, p. 66; Kent, p. 30.
[72] Burnham, p. 66; Goldberg and Vendel, p. 25.

electromechanical coin-op games. During his undergraduate years Bushnell spent his summers and weekends working at an amusement park north of Salt Lake City.[73] He started out on the midway as a "barker," someone who convinced park-goers to play games. Eventually he was promoted to manage the park arcade.[74] During his time there he learned the ins and outs of the coin-op amusement business, how machines were constructed, what mattered in their design, and which games were popular.[75]

Starting in 1969, Bushnell and Ted Dabney, a friend and fellow engineer at Ampex, began tinkering with a coin-op version of *Spacewar!*[76] The pair first envisioned a game that would run on a Data General 1600 mini-computer. However, after some experimentation it became clear that the idea would not be economically viable due to costs. Bushnell and Dabney explored a timesharing system that would allow several games to run simultaneously on one piece of hardware to ameliorate the cost per machine, but ultimately failed to make a working model.[77] They put the project on the backburner for a time. Then, during a conversation at Ampex, Bushnell and Dabney hit upon the idea that they could draw an image on a TV screen and manipulate it by digitally controlling the vertical and horizontal hold circuits.[78] Dabney was able to successfully engineer a comparatively inexpensive motion circuit for the job, and Bushnell sold the idea to Nutting Associates, a coin-op amusement company in Mountain

[73] Bushnell, as quoted in Ramsay, p. 18; Burnham, p. 66; Kent, p. 30;
[74] Bushnell, as quoted in Ramsay, p. 18; Burnham, p. 66; Goldberg and Vendel, p. 26; Kent, p. 29.
[75] Goldberg and Vendel, p. 26.
[76] Goldberg and Vendel, p. 25-31.
[77] Lowood, p. 8.
[78] Samuel F. (Ted) Dabney. Oral history by Chris Garcia, Mountain View, California, July 16, 2012. The Computer History Museum, Mountain View, CA.; Goldberg and Vendel, p. 30

View. Bushnell quit Ampex and joined Nutting Associates to oversee its creation. Several months into the process, Dabney followed.[79]

Bushnell and Dabney called their machine *Computer Space* (1971) (fig. 1-9). As a coin-op amusement machine, it was a mixture of complex technology and simple design. The computer, television, and electrical engineering that went into its design were far more high-tech than anything found in its electromechanical coin-op counterparts. The implementation of motion circuits, logic circuits, and memory into an economically viable machine was a significant technological advance. Its modular individual components were boxed into a manageable design. The game was "made up essentially of four subassemblies: TV set, power supply, computer (brain box), and control panel."[80] The television was a common portable unit made by General Electric and navigable by anyone familiar with a home television. Power supplies and control panels were electromechanical norms and comprehensible to coin-op industry personnel. *Computer Space* featured a top circuit board (memory), middle circuit board (motion), and bottom circuit board (sync star). The game was simple enough that each could be broken down into basic lists of functions, with seven on the top, five on the middle, and six on the bottom. The first two were entirely devoted to graphics and basic controls, while the third handled auxiliary functions such as star generation, scoring, sound, and coin counting. The segmentation was intended to allow coin-op industry operators and technicians to diagnose malfunctions involving unfamiliar computer technology and order the necessary parts to fix them.

[79] Dabney, July 16, 2012; Goldberg and Vendel, p. 37, 39.
[80] "Computer Space Service Manual, 1972." Steve Bristow Papers, Stanford University Special Collections, Stanford University Libraries, Stanford, CA, Box 6, Folder 5.

Figure 1 - 9: *"Computer Space."* The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=1530&image=1 (accessed 5/15/2015)

Computer Space was designed as a coin-op amusement machine first and as a computer second. Though Bushnell had knowledge of high-level computing through his time at the University of Utah, his design philosophy stemmed from experiences operating novelty and pinball games. He had a perspective on both engineering and business quite different from that of Pitts and Tuck. *Computer Space* therefore attempted to meet the needs of the coin-op entertainment industry rather than faithfully reproduce *Spacewar!*[81] Bushnell tried to make the internal structure and components as simple as possible so that coin-op industry personnel could perform much of the repair and maintenance. He housed the game in an eye-catching molded fiberglass cabinet to draw user attention (fig. 1-10). Both with *Computer Space* and the games he helped create later, Bushnell said that he was "putting myself in the box. The things I had learned about getting you to spend a quarter on me in one of my midway games, I put those sales pitches in my automated box."[82]

Different Philosophies, Different Outcomes

The Galaxy Game and *Computer Space* represented two different technological philosophies for video arcade games. Nowhere was this more apparent than in the interactions between its respective designers. In August 1971, Bushnell learned about Pitts and Tuck's project through a mutual acquaintance. He called Pitts to schedule a meeting at Nutting Associates, and there showed him *Computer Space*. Bushnell gave a

[81] Dabney, July 16, 2012.
[82] Bushnell, as quoted in Kent, p. 29.

friendly warning that his version would be cheaper to produce and *The Galaxy Game* wouldn't be able to compete. Though very impressed that any version of *Spacewar!* could be manufactured for so little money, after Pitts played it he decided that it was "garbage" because it was a poor imitation of the original.[83] Bushnell was equally skeptical about Pitts and Tuck's expensive creation. Later, the Stanford student union was one of the first locations for *Pong* (1972), a game put out by Bushnell's Atari, Inc. and designed by Atari employee Al Alcorn. While collecting coins from a *Pong* machine, Alcorn saw *The Galaxy Game* and was amazed to find "a real minicomputer in there."[84] He talked to Bushnell about the design and was told it was precisely the wrong way to make a video arcade game: "[Bushnell] said [Pitt is] giving away two or three bucks with every quarter you put in. It doesn't make viable sense at all."[85]

The Galaxy Game struggled economically because of its expense. It had great popularity with users. Students commonly gathered to play at the Stanford student union on Friday and Saturday evenings, and a competitive culture built up around the game.[86] *The Galaxy Game* generated a steady revenue stream from the time of its placement until it was removed in May of 1979 due to mounting maintenance difficulties, but the revenue did not cover the cost of creation. The original version also had reliability problems that required time and money to fix.[87] It took years to recoup the initial investment of

[83] Personal conversation with Bill Pitts at the Computer History Museum, July 13, 2013.
[84] Allan Alcorn. Oral history by Henry Lowood, Mountain View, California, April 26 and May 23, 2008. The Computer History Museum, Mountain View, CA.
[85] Alcorn, April 26 and May 23, 2008.
[86] Personal conversation with Bill Pitts, July 13, 2013.
[87] Pitts and Russell, July 13, 2013.

operating *The Galaxy Game* in just one location. No economic opportunities to distribute it widely ever materialized, and neither Pitts nor Tuck made another game.

Bushnell and Dabney's *Computer Space* performed better in the marketplace than the *Galaxy Game*, but was too expensive and intimidating to be a hit with coin-op industry. It failed to attract much attention at the 1971 annual meeting of the Music Operators Association, a major coin-op industry convention with origins in the jukebox era. *Computer Space* probably fell short due to its price tag, intimidating aura of computer technology (a major red flag given that coin-op personnel would have to service the machine), and its "bizarre" cabinet design.[88] The molded fiberglass exterior of *Computer Space* was eye-catching but added to manufacturing costs and concerned potential buyers who would have to maintain or replace it. *Computer Space*'s service manual noted that the "strength and resilience of fiberglass" made the need for such repairs unlikely, but coin-op industry mediators accustomed to the realities of the field were unconvinced.[89] In the end, Nutting Associates failed to sell the 1,500 units it originally manufactured.[90]

In hindsight, *Computer Space* and *The Galaxy Game*, created at the same time and in the same region, demonstrated the technological path of video games for at least the next fifteen years. *Computer Space* was a greater economic success even though *The Galaxy Game* received a more enthusiastic response from users (at least within its small demographic of Stanford students).[91] Bushnell's creation sold just well enough to provide

[88] Adlum, as quoted in Kent, p. 33.
[89] "Computer Space Service Manual, 1972." Steve Bristow Papers, Box 6, Folder 5.
[90] Kent, p. 34.
[91] Pitts and Russell, July 13, 2013.

proof of concept, and its small royalties funded his start-up company, Atari.[92] Though *The Galaxy Game* was more high-tech and offered a superior user experience, its devotion to the technical characteristics of *Spacewar!* made it expensive to build and a poor economic product. In the years that followed, video games transitioned from a hacker-culture plaything to a mass audience consumer technology. Alcorn would call the shift "wonderful," though almost certainly with a sense of irony. He described collecting coins at the Stanford student union after *Pong*'s meteoric rise to success: "I run (sic) into [Pitts] occasionally, but he'd be there all day working on [*The Galaxy Game*], and [Stanford is] probably the only place – one of the few places in America – people would play it, because you needed a physics majors (sic) to really play this thing. Meanwhile, we had this stupid *Pong* game sitting there, and I was scooping out fistful (sic) of quarters."[93]

Part Three – 1972-1978: The *Pong* Boom and Bust

On June 28, 1972, Bushnell and Dabney incorporated "Atari," named for the Japanese word roughly equivalent to "check" in a game of chess.[94] Following the release of *Computer Space* Bushnell had left Nutting Associates over royalty disputes, and Dabney joined him. With an initial investment of $250 each, they founded Atari as an engineering consulting business specializing in coin-op games and set up shop in a small office in the Santa Clara industrial district. In the early days Atari stayed afloat mostly

[92] Kent, p. 38; Pitts and Russell, July 13, 2013.
[93] Alcorn, April 26 and May 23, 2008.
[94] Originally Bushnell and Dabney called their partnership "Syzygy," and the company title was printed on *Computer Space* machines. However, when they filed for incorporation the name was already taken, and they settled on Atari instead. Burnham, p. 76; Kent, p. 35.

through *Computer Space* royalties and a lucrative pinball route operated by Bushnell and Dabney.[95] It was a very simple beginning, and there was little indication that Atari would become the centerpiece of a multi-billion dollar industry.

Pong, released by Atari in November of 1972, changed everything. It was a remarkable success, and introduced the American public to video arcade games for the first time. It helped Atari grow from a small start-up to a multi-million dollar international business in only a few years. After its release other companies rushed to capitalize on a wave of user enthusiasm, and formed a video arcade game industry.

Pong

Al Alcorn was Atari's second employee (after a seventeen year old secretary who gave the company an air of legitimacy by answering the phone and asking callers to wait to talk to Bushnell).[96] Bushnell and Dabney knew Alcorn from Ampex, where he worked on the "design and manufacture of large scale information storage and retrieval systems."[97] Bushnell recruited Alcorn and offered him a salary of $1,000 per month and ten percent of the company.[98] Though it was a pay cut, Alcorn accepted. He felt stifled within Ampex's corporate hierarchy, and developing games in a small company with a relaxed environment appealed to him. He hoped Atari would give him greater freedom and opportunity to develop technology in new and exciting directions. On a more

[95] Kent, p. 39.
[96] Al Alcorn, as quoted in Kent, p. 39.
[97] "Directors, Officers, and Principal Selling Shareholders Questionnaire." Al Alcorn Papers, Stanford University Special Collections, Stanford University Libraries, Stanford, CA, Box 1, Folder 6.
[98] Allan Alcorn. "First-Hand: The Development of Pong: Early Days of Atari and the Video Game Industry." IEEE Global History Network: http://ieeeghn.org/wiki6/index.php/First-Hand:The_Development_of_Pong:_Early_Days_of_Atari_and_the_Video_Game_Industry (accessed 5/28/15).

practical level, Alcorn also knew that spending some time at a different company might provide upward mobility at Ampex. He had seen other employees leave only to be hired back later at a higher job grade and reasoned that he might do the same.[99]

The first game that Bushnell asked Alcorn to design was a simple ping-pong game involving "one ball, two paddles, and a score… nothing else on the screen."[100] Bushnell claimed that the work had been contracted by General Electric, but, famously, lied. Atari had no business from General Electric, and Bushnell didn't think much of the ping-pong game concept. Earlier that year he had seen a version demonstrated on the Magnavox Odyssey, the first home video game console, and dismissed it as uninteresting.[101] Alcorn recalled "I found out later this was simply an exercise that Nolan gave me because it was the simplest game that he could think of. He didn't think it had any play value. He believed that the next winning game was going to be something more complex than *Computer Space*, not something simpler."[102] Bushnell wanted Alcorn to make the best game that he could even if it was only a training exercise, and concocted a story to motivate him.

Alcorn set to work developing the game. In search of a model, Alcorn consulted Bushnell's schematics for *Computer Space* but "found them illegible."[103] Through a "little chalk talk," Bushnell conveyed the basic aspects of the motion circuit.[104] Alcorn was charged with creating the game for $15 in components. Though he failed to achieve

[99] Alcorn, April 26 and May 23, 2008; Alcorn, IEEE Global History Network.
[100] Alcorn, as quoted in Kent, p. 40.
[101] Alcorn, April 26 and May 23, 2008; Bushnell, as quoted in Ramsay, p. 27; Lowood, 13.
[102] Alcorn, as quoted in Kent, p. 40-41.
[103] Kent, p. 41.
[104] Alcorn, April 26 and May 23, 2008.

this mark, he was remarkably successful at keeping costs down. He jury-rigged inexpensive chips, adapted a black and white Hitachi TV to serve as a monitor, and designed an inexpensive power supply.[105] The audio features were also result of cost-saving. As described by Alcorn

> Here I was developing this thing and feeling kind of frustrated because it already had too many parts in it to be a successful consumer product… I was running out of parts on the board. Nolan wanted the roar of a crowd of thousands… Ted Dabney told me to make a boo and hiss when you lost a point, because for every winner there's a loser. I said, 'Screw it, I don't know how to make any one of those sounds. I don't have enough parts anyhow.'[106]

Instead of adding costly components, Alcorn found simple sounds on the sync generator and used them to generate the game's audio. Beyond the internal hardware, Alcorn created design features that went above and beyond Bushnell's instructions to make the game more fun. He programmed the paddle to direct the ball in different directions based upon which segment was struck, and added a featured that made the ball accelerate after a set number of successful volleys.[107]

Alcorn finished *Pong* in early fall of 1972 (fig. 1-10). Though Bushnell had intended the game as a throwaway, he was impressed enough with the gameplay features to test it on location. Atari placed the first *Pong* machine at Andy Capp's Tavern near Stanford, setting it atop a wine barrel next to several pinball machines and a *Computer Space*. Within two weeks the game had ceased to function because the coin tray had overflowed. People flocked to Andy Capp's Tavern just to play *Pong*, which was

[105] Alcorn, April 26 and May 23, 2008; Alcorn, IEEE Global History Network.
[106] Alcorn, as quoted in Kent, p. 41-42.
[107] Kent, p. 41.

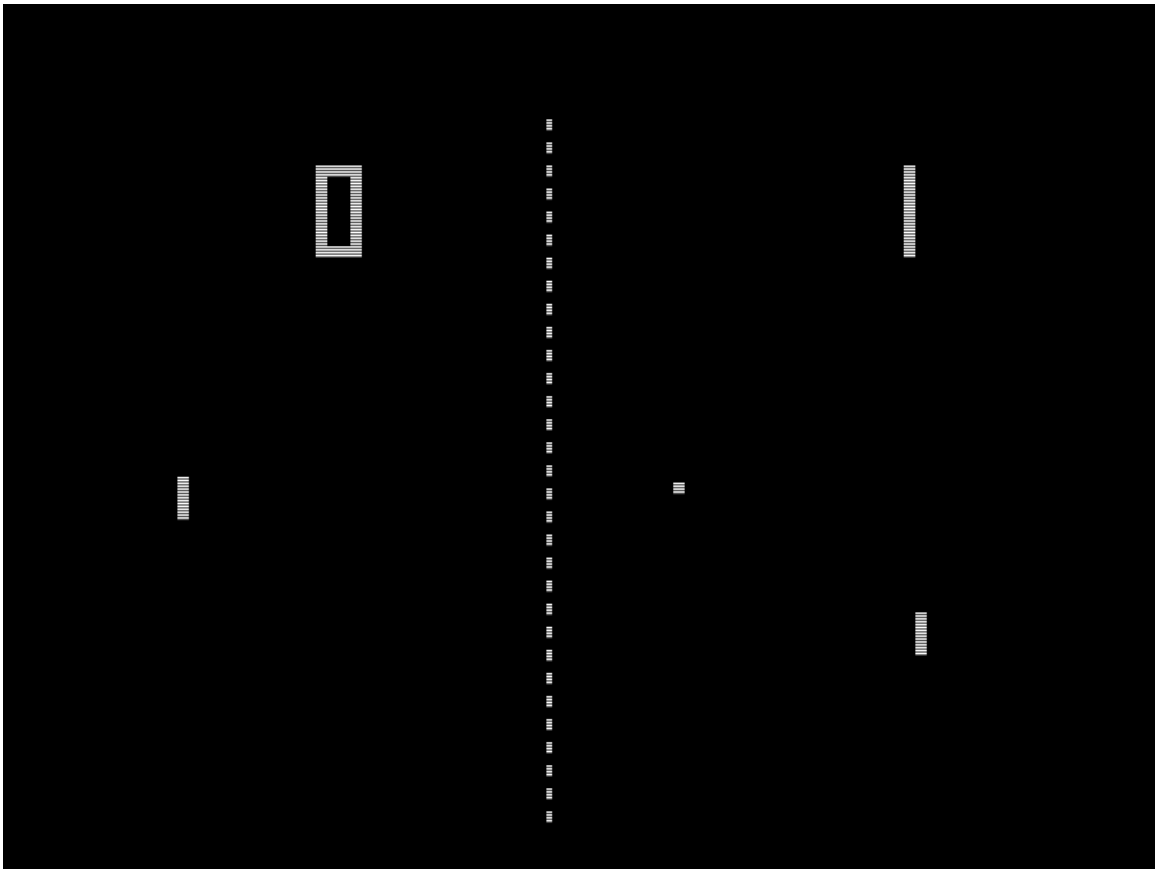

Figure 1 - 10: *Pong* play screen. Wikipedia Commons. http://upload.wikimedia.org/wikipedia/commons/f/f8/Pong.png (accessed 5/16/2015)

something virtually unheard of in the coin-op amusement industry. Alcorn recalled "The game had no instructions, nothing, and yet it was a big success. There had been nothing like it. All of a sudden the quarters started coming in, and it made big money."[108] At the time Bushnell was in Chicago trying to sell *Pong* to Bally. After hearing about its test location success he decided that Atari would manufacture the game itself, and sabotaged

[108] Alcorn, IEEE Global History Network.

negotiations by hinting at fundamental flaws.[109] He returned to California and tried to secure a loan to set up manufacturing facilities, but was turned down by several banks that associated his venture with pinball and organized crime. Eventually he succeeded in convincing Wells Fargo to advance Atari a $50,000 credit line. He used the money to set up a basic assembly plant in at an abandoned roller rink near Atari's Santa Clara office.[110]

Boom - 1972-1975

Reports of *Pong*'s success in Andy Capp's Tavern quickly spread to nearby coin-op distributors. Atari's first order came from Advance Automatic Sales in San Francisco, ten machines at $1,200 each. Another order for ten came from Portale Automatic in Los Angeles.[111] As described by Stephen Kent, "Word traveled quickly in the amusement industry. Though the first orders were small, they mounted. By the end of 1973, Atari had filled orders for 2,500 *Pong* machines. By the end of 1974, that number grew to more than 8,000. It became more popular than the best pinball machines of the day."[112]

Pong was well-received by the coin-op industry. Its simple instructions and gameplay meant that it had a low barrier for entry, but its nuances made it difficult to master. The design was ideal because it could attract first time users and encourage future use by rewarding investment with skill.[113] Though *Pong* was difficult for coin-op industry personel unfamiliar with computer technologies to fix, its solid state internal architecture

[109] Alcorn, IEEE Global History Network; Kent, p. 45.
[110] Kent, p. 51.
[111] Bushnell, as quoted in Kent, p. 53.
[112] Kent, p. 54.
[113] "A Red-Hot Market for Video Games." *Business Week*, November 10, 1973. Atari, Inc. Business Plans, 1974-1975, Stanford University Special Collections, Stanford University Libraries, Stanford, CA, Box 1, Folder 1.

meant high reliability by comparison to most electromechanical coin-ops. The joysticks were the only moving parts in the machine. Reduced maintenance was attractive to coin-op industry operators plagued with the cost of repairing the many moving parts in most pinball and electromechanical novelty games. *Pong*'s solid state design, along with its light and compact casing, made it comparatively easy to transport and place. With its minimal footprint, understated cabinet, mellow sounds, high-tech computer appeal, and non-violent "genteel" theme, *Pong* could be (and often was) comfortably placed in areas where other more gaudy coin-op games were not.[114] As described by psychologists Geoffrey and Elizabeth Loftus in 1983, "For whatever reasons, Pong managed to escape from the smoky, seedy atmosphere of its pinball arcade predecessors, and it set the stage for the widespread status currently enjoyed by today's video games."[115]

Pong established Atari as a major company in the coin-op amusement industry (fig. 1-11). Its sudden and unexpected success caused Bushnell to shift Atari's focus from engineering consulting to amusement machine manufacturing.[116] Demand was so high that Atari's 1973 fiscal year strategy was "short and simple," "Produce *Pong* at the fastest rate possible to serve a computer video game market limited only by supply and not demand."[117] As *Pong*'s profits soared, so did awareness of video arcade games. An article in *Business Week* stated "The game is *Pong*, and even though it is less than a year old, the scene of players battling over its TV screen is becoming commonplace in thousands of

[114] Loftus and Loftus, p. 7.
[115] Loftus and Loftus, p. 7-8.
[116] Alcorn, IEEE Global History Network.
[117] "The Company." Atari, Inc. Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

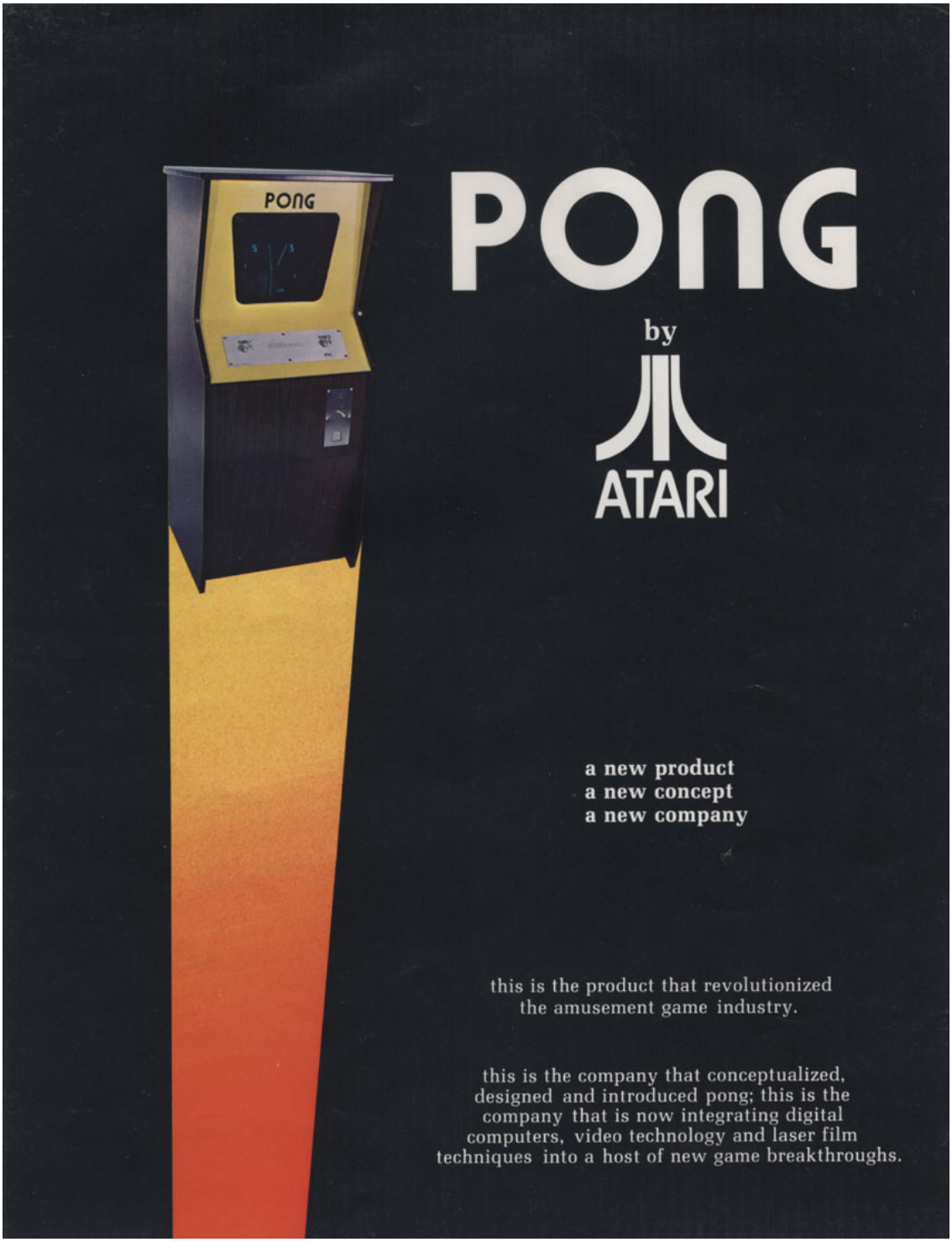

Figure 1 - 11: "*Pong*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=1988&image=1 (accessed 5/16/2015)

bars, pizza parlors, hotel lobbies, and bus terminals across the country."[118] Atari noted that *Pong* "won broad player acceptance both domestically and internationally across a spectrum of locations ranging from airports, arcades and taverns to sophisticated hotels, department stores, and restaurants."[119]

Pong's runaway success created competition. Numerous other video game companies were founded in the mid-1970s. No devoted video game manufacturer was a competitor to Atari, but it nonetheless cast a wary eye towards fledgling producers just cutting their teeth. It scouted out competitors at electronics, toy, and coin-op trade shows, noting their innovations and engineering trajectories.[120] Existing electromechanical amusement machine manufacturers posed a potential threat. A few, most notably Midway (a subsidiary of Bally) and Allied Leisure, began manufacturing their own video arcade games as soon as *Pong* proved there was a market for them. Atari anticipated that both companies would have a role in the industry moving forward due to their deep pockets and established coin-op industry distribution networks. Atari was also concerned that well-established electronics and television manufacturers, such as Intel, Magnavox, Phillips, RCA, Sony, and Texas Instruments, would complete for video game dollars via home electronics. At the beginning of the industry most of this was speculative but not unreasonable, especially following the development of a consumer game prototype by transistor manufacturer National Semiconductor in 1974.[121]

[118] "Red-Hot Market for Video Games." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[119] "Overview." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[120] "Trade Show Reports," Steve Bristow Papers, Box 12, Folder 15.
[121] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.

The video game industry expanded rapidly. Though still "embryonic," industry profits exploded from virtual nonexistence to an estimated $56 million in 1973.[122] Video arcade games penetrated previously untapped markets, demonstrating, as Atari put it, an "ability to crack both sophisticated (Hilton Hotel lobbies) and family-oriented (shopping centers and department stores) locations" that had been traditionally closed to the coin-op industry.[123] Weekly earnings of video arcade games surpassed those of "any other amusement machine ever produced," and because demand exceeded supply there was considerable opportunity.[124] Companies quickly filled the gap. Though Atari was the single largest company in the genre, it placed its own market share at only seventeen percent as of 1974.[125]

Video arcade games quickly spread beyond the borders of the United States. Interest in other countries presented opportunities for industry growth. In 1974 Atari stated its ambition to "become the largest world-wide electronic amusement machine producer in total dollar sales in the industry by the end of FY1977."[126] It was already heavily involved in foreign markets, with a reported thirty-five percent of total sales originating outside of the United States.[127] It opened branches in Canada, Japan, and Hawaii. Atari targeted markets in South Asia, Latin America, the South Pacific, Africa, and the Middle East, anticipating that "increasing affluence, easing import restrictions,

[122] The estimate was Atari's, and may have been inflated to emphasize growth potential. However, the number is plausible given the rapid growth of Atari and popularity of tennis-style video games at the time. "The Markets." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[123] "The Markets." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[124] "The Markets." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[125] The estimated market share may have been somewhat exaggerated to emphasize Atari's growth potential, but nonetheless reflected the rush of other companies into the video arcade game industry.
[126] "The Company." Atari, Inc. Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[127] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.

and more countries eager to see high-technology local industry will spur demand for coin-op electronic amusements."[128] It entered into joint ventures for video game manufacturing and distribution with companies in England, France, Italy, and Japan.[129] Halfway through 1974 the company was active in twenty-one countries and had contracts with local manufacturers in nine.[130]

Bust - 1976-1978

In a rush to capitalize on sudden demand the video game industry overextended itself. Back in 1973 a vice president at Williams, a major manufacturer of pinball machines and other coin-op amusements, told *Business Week* that he was skeptical about the long term viability of video arcade games. He pointed out that "sales of the video games are bound to slow when every location has been supplied with one and there is only the replacement market to live on."[131] He said (prophetically) that "The small companies will be in trouble when the crunch arrives."[132] As the novelty of video arcade games began to wane both sales and revenues sales slowed considerably.

Pong clones oversaturated the market by the mid-1970s. As described in chapter two, there were few legal protections available to the original creators of a video game.[133] According to coin-op industry journalist Ed Adlum, "*Pong* was the beginning of the

[128] "The Markets." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[129] It also attempted joint ventures in Japan, but two attempts to negotiate partnerships fell through. "Atari, Inc. Consolidated Financial Statements." Al Alcorn Papers, Box 1, Folder 4; "Minutes of the Board of Directors' Meeting, August 21, 1975." Al Alcorn Papers, Box 1, Folder 2; "Notes to Consolidated Financial Statements, November 29, 1975 and May 31, 1975." Al Alcorn Papers, Box 1, Folder 2.
[130] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[131] "A Red-Hot Market for Video Games." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[132] "A Red-Hot Market for Video Games." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[133] Chapter two, "Imitation as Common Practice."

video era, a new idea in those days. People ripped it off. There were some companies that just came out of nowhere, saw what was happening with *Pong*, and said 'I want to get part of this action.'"[134] Tim Skelly, a developer at video game start-up Cinematronics, later wrote "Like virtually all pioneers who came to find gold in California, [Cinematronics founder Jim] Pierce and his cohorts trod in the footprints of those who went before them, which is to say, they bought the schematics, software, and hardware necessary to make and sell their own copy of *Pong*."[135] Williams managed to put a *Pong* knock-off on the market by the end of 1973 (fig. 1-12). Midway produced a similar clone called *Winner* (1973) (fig. 1-13).[136] In short order it reportedly sold 9,000 copies at more than $1,000 apiece.[137] Allied Leisure and Chicago Coin also made clones.[138] Though in 1974 Atari reported it had sold roughly 7,000 authentic *Pong* machines, it estimated that the total number of *Pong*-type machines in circulation was 45,000.[139]

Other types of video games also carved into video arcade game profits. In 1976 General Instruments released the AY-3-8500 chip, which condensed all of the required internal hardware of a video game into a single chip. The invention allowed for the relatively simple implementation of home video game consoles with associated AY-3-8500 cartridges, and many companies, including Coleco, Mattel, Magnavox, RCA, and Fairchild, took advantage of the opportunity to create simple home video games. Most

[134] Adlum, as quoted in Kent, p. 61.
[135] Skelly, p. 139.
[136] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[137] "A Red-Hot Market for Video Games." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[138] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[139] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1

Figure 1 - 12: "*Pro Tennis*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=2578&image=1 (accessed 5/16/2015)

Figure 1 - 13: *Winner* video arcade game. The International Arcade Museum. http://www.arcade-museum.com/images/117/1178572056.jpg (accessed 5/16/2015)

were clones of *Pong*.[140] Handheld video games created by toy manufacturers Mattel, Milton Bradley, and Parker Brothers also provided competition for video arcade games.[141]

In 1976 a drop in sales put many companies, including Atari, in financial difficulty. Missteps had sapped company funds. Atari's Canadian branch went under

[140] Martin Campbell-Kelly. *From Airline Reservations to Sonic the Hedgehog: A history of the Software Industry* (Cambridge: MIT Press, 2002), p. 274-275; Mark J.P. Wolf. "The Video Game Industry Crash of 1977," in Wolf, ed., p. 83-85.
[141] Kent, p. 201; Montfort and Bogost, p. 121.

almost as soon as it was founded.[142] Manufacturing costs in Canada were comparatively high, and the subsidiary proved unnecessary for distribution to Canadian markets because of close proximity to U.S. factories.[143]Atari Japan was plagued by a variety of managerial and labor problems, and in 1974 was closed in favor of a distribution agreement with the Nakamura Amusement Machine Manufacturing Company (Namco).[144] Its Pacific branch in Hawaii also faltered. By December of 1974 it held an inventory of only 41 machines, and was sold soon after.[145] Atari ran into manufacturing problems due to a lack of vertical integration and thefts on the assemble line, and labor problems due to a unionization attempt by its workers.[146] Poor accounting practices caused *Gran Trak 10*, a major Atari R&D effort and its bestselling game in 1974, to retail at $995 while costing $1,095 to produce.[147] Atari was overextended in its attempts to turn video games into consumer electronics products with home versions of *Pong* and the development of the Atari Video Computer System (VCS) home console. In desperate need of funds, the board of directors decided to sell the company to media-giant Warner in 1976.[148]

In 1977 the United States video game industry underwent a sharp decline. After impressive sales figures in Christmas of 1976, home video game sales dipped precipitously in 1977. Consumer interest remained relatively high, but "there was an

[142] "Minutes of the Board of Directors' Meeting, December 13, 1974." Al Alcorn Papers, Box 1, Folder 2; "Waiver of Notice of Meeting of Board of Directors of Atari, Inc." Al Alcorn Papers, Box 1, Folder 2.
[143] "Other Transactions." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[144] Goldberg and Vendel, p. 122-125.
[145] "Minutes of the Board of Directors' Meeting, December 13, 1974." Al Alcorn Papers, Box 1, Folder 2; "Waiver of Notice of Meeting of Board of Directors of Atari, Inc." Al Alcorn Papers, Box 1, Folder 2.
[146] Bushnell, as quoted in Kent, p.52; Goldberg and Vendel, p. 102-103.
[147] Alcorn, April 26 and May 23, 2008; Cohen, p. 42; Goldberg and Vendel, p. 130-131, 250.
[148] Alcorn, April 26 and May 23, 2008; Kent; p. 102-105.

oversupply of consoles (hardware) and a shortage of innovative games (software)."[149] Software innovation in both home video games and video arcade games had stagnated. In the short run money could be made from copying existing games and genres. It cost far more for companies to develop original ideas. Though the downturn centered upon home video games, video arcade game sales dipped as well.[150] High sales projections for Christmas 1977 never materialized. In the aftermath, Fairchild, National Semiconductor, and RCA left the video game business. Magnavox scaled back its investment. Allied Leisure declared bankruptcy.[151]

Part Four – 1979-1983: The Golden Age

The "Golden Age" of video arcade games began in North America in 1979, shortly after the release of *Space Invaders* (1978), created by the Japanese coin-op amusement manufacturer Taito, in October of 1978. Though the video arcade game industry had declined in North America, the Japanese market remained fertile ground for both innovation and consumption. Games coming out of Japan "revived" the American video arcade game industry and stimulated the creation of new content, contributing to an era of increased popularity, public interest, and profits for video arcade games (fig. 1-14).

[149] Steven Malliet and Gust de Meyer. "The History of the Video Game," in Raessens and Goldstein, eds., p. 28. See also Mark J.P. Wolf. "The Video Game Industry Crash of 1977," in Wolf, ed., p. 86-87.
[150] Malliet and de Meyer, p. 28.
[151] Wolf, p. 86-87.

Space Invaders

Social and economic conditions in Japan were ripe for an expansion of the video arcade game business. When the first video arcade games reached Japanese shores, the country already had a strong coin-op amusement industry built around "pachinko," mechanical gambling devices similar to pinball but lacking a flipper. The machines were "to put it mildly, wildly popular."[152] Existing companies, distribution networks, and pratices provided the necessary structures to import video arcade games following the success of *Pong*. The considerable popularity of video arcade games in Japan prompted local companies, such as Taito, Namco, and Nintendo, to produce their own games.

In the fall of 1978, Taito's *Space Invaders* was taking Japan by storm (fig. 1-15). Ed Adlum recalled, "[*Space Invaders*] was such an outrageous hit in Japan that many vegetable stores and other little stores would get rid of their vegetables and dedicate the whole store to *Space Invaders*. All told, worldwide, they say there were at least 300,000 *Space Invader* games built, including counterfeit versions."[153] Adlum recollection might not be overblown. Taito reportedly installed 100,000 *Space Invaders* units in Japan by the end of 1978 for a total profit of roughly $600 million. Use of the game was so widespread that it caused a nation-wide shortage of the 100-yen coin, prompting the Japanese national mint to triple production.[154]

[152] Malliet and de Meyer, p. 28.
[153] Adlum, as quoted in Kent, p. 116.
[154] Burnham, p. 182; Kent, p. 116; Frank Laney, Jr.,ed. "Can Asteroids Conquer Space Invaders?" *Electronic Games,* Vol. 1, No. 1, Winter 1981, p. 31.

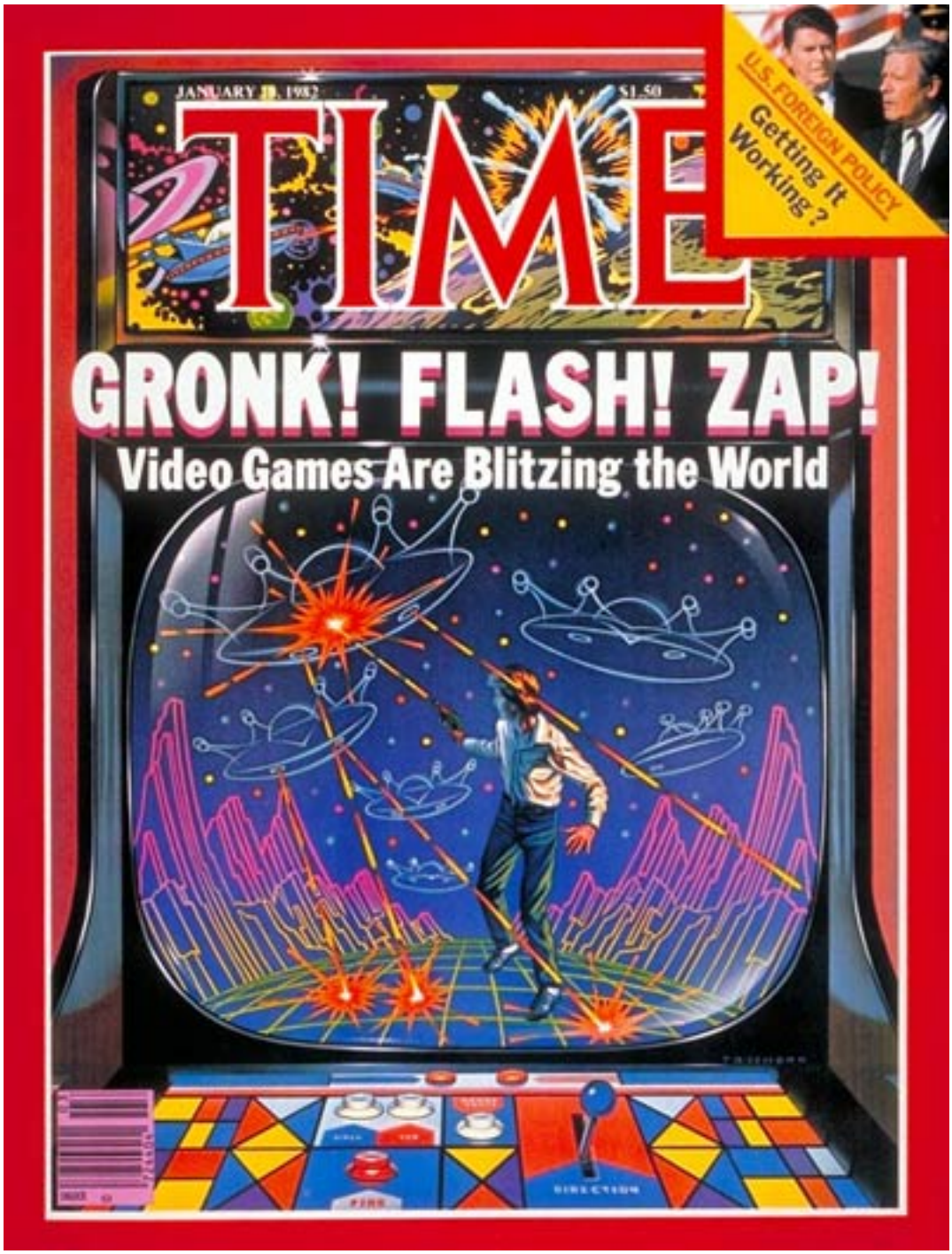

Figure 1 - 14: Cover of *Time* magazine, Jan. 18, 1982.
http://content.time.com/time/covers/0,16641,19820118,00.html (accessed 5/22/15)

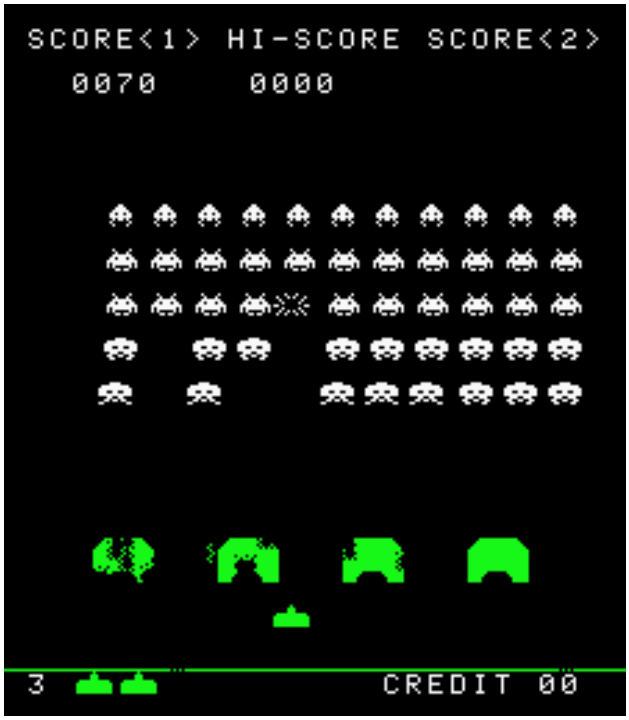

Figure 1 - 15: *Space Invaders* play screen. The International Arcade Museum. http://www.arcade-museum.com/images/118/118124217163.png (accessed 5/16/2015)

Taito licensed *Space Invaders* to Midway for United States distribution. Within the first year, Midway sold more than 60,000 machines at roughly $1,700 each.[155] *Space Invaders* was popular enough that coin-op industry operators could rapidly recoup their initial investment. Arcade owner Joel Hochberg recalled that it was "the first time" that "a significant portion of the cost" of buying a video arcade game could be recouped "in any one week."[156] He marveled, "It was hard to believe that any game could capture the audience to the degree that it was capable of doing."[157] *Space Invaders*' release revived public interest in video arcade games. Over the course of a few months, video arcade games went from a declining technology to a thriving one. Video game journalist

[155] Kent, p. 117.
[156] Hochberg, as quoted in Kent, p. 117-118.
[157] Hochberg, as quoted in Kent, p. 117-118.

Van Burnham called *Space Invaders* "One of the all time classic arcade videogames" and argued in was "responsible for bringing the game industry out of the dark, smoky, back-alley bars it had since been relegated to and back into pizza parlors, bowling alleys and malls across the country and around the world."[158]

"Video Madness"

In the years following *Space Invaders*, video arcade games saw a remarkable rise in popularity. Machines in prime locations could generate up to $1,000 per week.[159] High and well-publicized profits beckoned would-be coin-op amusement operators to enter the industry. As described by video arcade game scholar Carly Kocurek, "Video gaming was very lucrative for a number of long-term operators and lured others into the business as the intense media coverage made the games seem like an avenue to fast riches."[160] Video arcade games came to dominate the coin-op amusement industry, and near its peak in 1982 accounted for eighty-seven percent of industry revenue.[161] The expansion of both size and profits came with added interest from the public and from auxiliary businesses eager to cash in on the craze. In 1981, Julie Salamon of the *Wall Street Journal* wrote

> Video madness is sweeping the country with flashing colors, booming explosions, nerve-tingling action and little electronic monsters like the invaders from space that adorn this article. Coin-operated electronic games are sprouting in places where their ancestor, pinball, is *machine non grata*.

[158] Burnham, p. 182.
[159] Martin Jaffe. *Regulating Video Games* (Chicago: American Planning Association, 1982), p. 1.
[160] Carly A. Kocurek. "Coin-Drop Capitalism: Economic Lessons from the Video Game Arcade," in Wolf, ed., p. 196.
[161] Ralph Lally ed. "Too many games, too many operators… too little revenue," *Play Meter*, Vol. 8, No. 22, November 1982, p. 43

> Movie theaters, convenience stores, bowling alleys and even cocktail lounges are pulling in players of all ages and types.[162]

Atari recorded $1 billion in gross revenue and $200 million in profits in 1981.[163] Bally saw $81.7 million in profits in 1981 and had recorded $81.8 million in profits through the first nine months of 1982. Bally President Robert Mullane credited continued strong sales of coin-op games for much of the company's success.[164] In 1982 the American public spent $5 billion on video arcade games.[165]

Emboldened by profits, video arcade game companies both in the U.S. and Japan developed numerous new games and genres. A craze over space combat games led to the creation of Atari's *Asteroids* (1979), which eventually supplanted *Space Invaders* as the most popular game in the country and drove the proliferation of video arcades (fig. 1-16).[166] Other popular space combat games such as Namco's *Galaxian* (1979), William's *Defender* (1980), and Cinematronic's *Star Castle* (1980) soon followed.[167] Using Sega's *Heavyweight Champ* (1976), the first two-player fighting game, as a model, Cinematronics developer Tim Skelly created *Warrior* (1979), which became the first hit of the genre.[168] *Battlezone* (1980), a tank simulation produced by Atari, became the first

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[162] Julie Salamon. "Watch Out, Earth! Invaders From Space Are Coming for You: Zap Them With a Laser Beam, It Only Costs a Quarter; Video Madness Breaks Out," *Wall Street Journal*, clipping in "Atari Almanac." Steve Bristow Papers, Box 13, Folder 8. Original emphasis.
[163] Jaffe, p. 1.
[164] Joyce Worley ed. "Bally has Record Year; Mr. & Ms. Pac-Man Have Baby," *Arcade Express*, Vol. 1, No. 9, December 5, 1982, p. 5.
[165] Burnham, p. 21.
[166] Ralph Lally, ed. "'The year the industry found itself:' Reviewing the coin-op year 1981," *Play Meter*, Vol. 7, No. 23, December 1981, p. 20.
[167] Burnham, p. 197, 200, 222, 230.
[168] Skelly, p. 148.

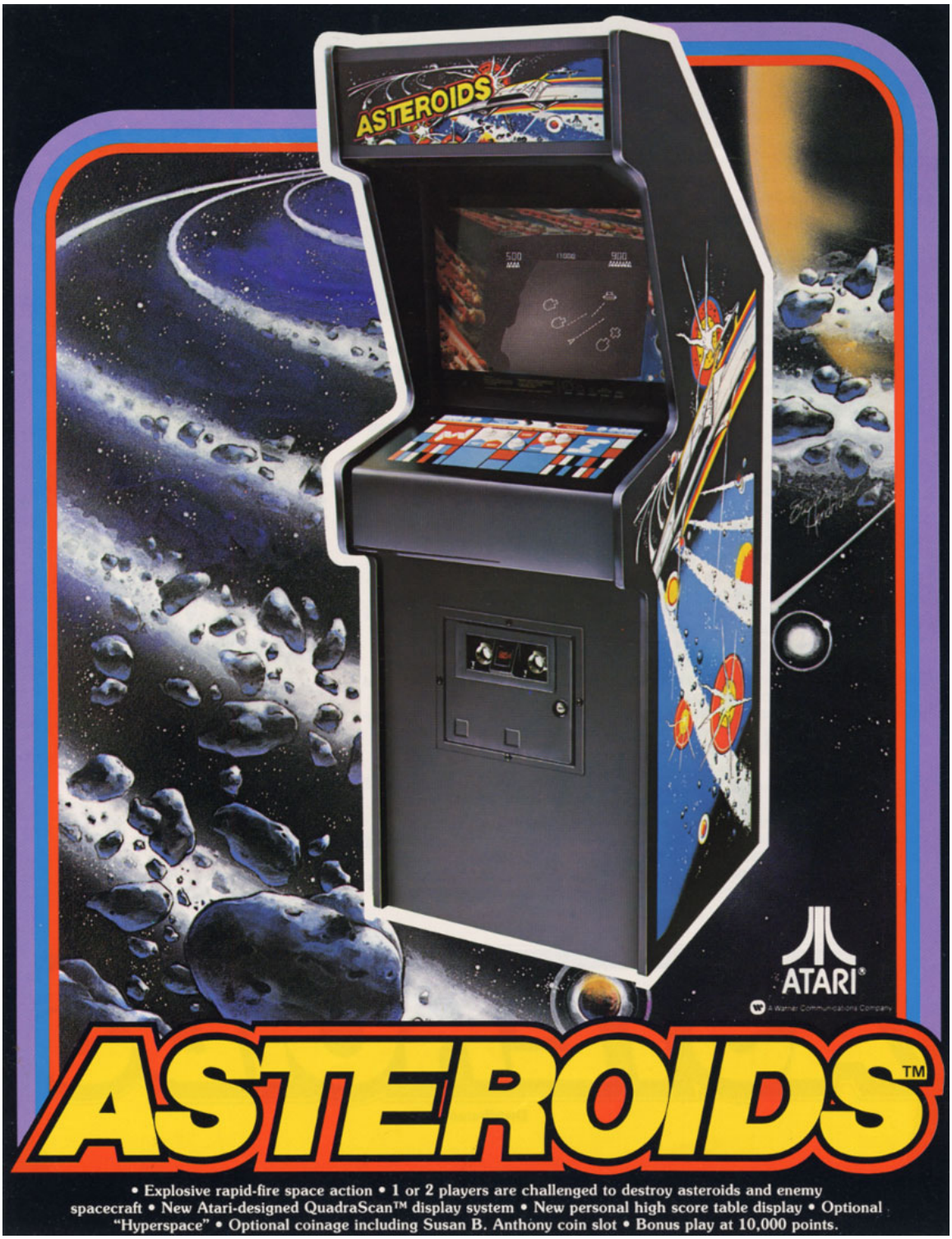

Figure 1 - 16: *"Asteroids."* The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=5391&image=1 (accessed 5/16/2015)

successful first-person shooter.[169] Nintendo's *Donkey Kong* (1981) sold 80,000 copies in the United States and launched the "platformer" genre.[170] Namco's *Pac-Man* (1980) spawned numerous iterations of the "maze chase" theme (fig. 1-17).[171] Over 250 million games of *Pac-Man* were played worldwide in 1981, and it became a symbol for the industry.[172]

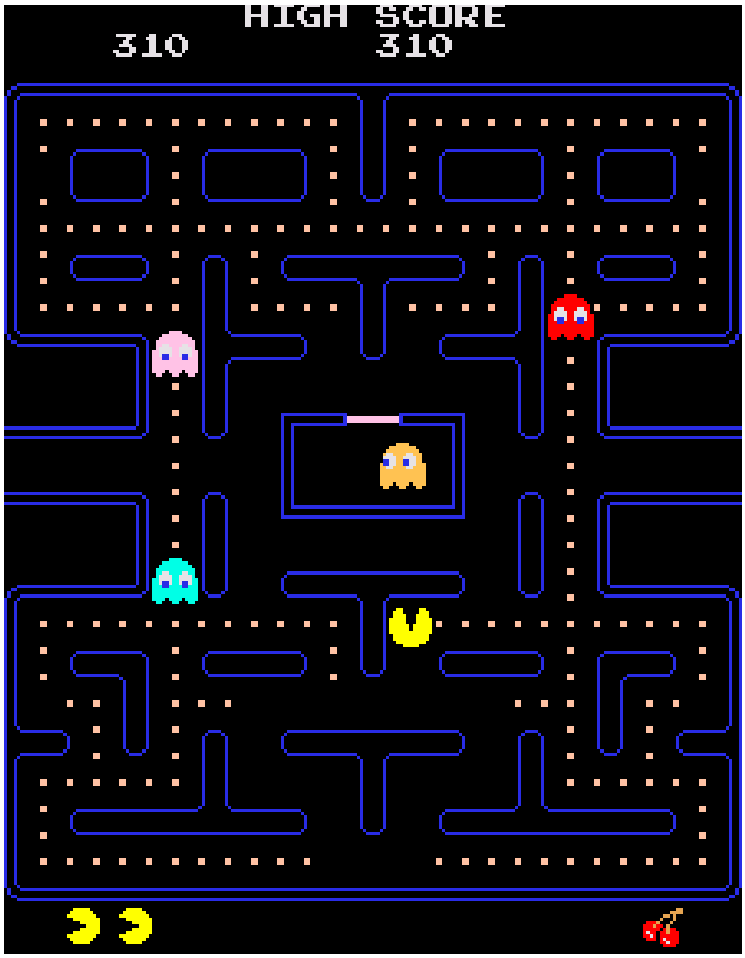

Figure 1 - 17: *Pac-Man* play screen. The International Arcade Museum. http://www.arcade-museum.com/images/118/118124214343.png (accessed 5/16/2015)

[169] Burnham, p. 216.
[170] Burnham, p. 247.
[171] Burnham, p. 225; Kent, p. 143.
[172] Burnham, p. 21.

Increased popularity and increased profits led to an increase of video arcade game spaces. Public amusement centers in areas such as boardwalks, amusement parks, and tourist shifted the balanced of coin-op machines to make video arcade games a significantly larger feature than other attractions.[173] Child-centric arcades such as Chuck E'Cheese's Pizza Time Theater (notably owned by Bushnell, who developed the idea at Atari and purchased it from the company before being forced out in 1978) began to appear.[174] For the first time, income of popular machines in prime locations could exceed income from food, drink, and other amusements.[175] "Video arcades," or spaces where video arcade games were the primary (and often sole) attraction, virtually unheard of before *Space Invaders*, became viable as game revenues increased. Estimates in *Newsweek* and *Time* placed the number of United States video arcades at 24,000, with the machines present in another 400,000 locations. 1.5 million video arcade games were said to be in circulation and accounted for $5 billion in revenue.[176]

The Golden Age was also a time of increased user community. As detailed in chapter four, video arcades provided users a dedicated space to come together, interact, and form identities.[177] They developed a subculture around experiencing the technology both directly through play and indirectly through observation, space, and discourse. Publications written by users and for users arose to serve the broader community. *Electronic Games* (starting in the winter of 1981) and *Arcade Express* (starting in August

[173] "A Red-Hot Market for Video Games." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[174] Marcus Webb. "Showbiz Pizza Place Knows Where the Coin-Op Profits Are," *RePlay*, Vol. 10, No. 11, August 1985, p. 46.
[175] Jaffe, p. 1.
[176] Wolf, p. 4.
[177] Chapter Four, part one, "Users and the Market," and part two, "Gamer Communities."

of 1982) facilitated the exchanged of information and gave voice to the user perspective. As stated in introduction to the first issue of the latter

> We'll pull no punches, make no bones, and in general, spare no effort to give you the best and most honest coverage of the electronic gaming world that we possibly can… to help you keep aware of what's happening in our favorite hobby. And in return, maybe you can help us: Send us the news you learn. Tell us your high scores. Give us your opinions. With your help, this will be the hottest, most timely news source in the industry. And we'll all have fun together![178]

The magazines routinely devoted page space and praise to high scores. They emphasized that expertise granted meritocratic status within the larger group. Users published strategy guides on how to earn higher scores. Most spoke not only of the mechanical aspects of games and the skills required to master them, but also the importance and value of community interaction.[179]

Part Five - The North American Video Game Crash of 1983

The Golden Age of video arcade games ended with the North American video game crash of 1983. By the end of 1982 doom-and-gloom among coin-op industry operators and distributors was palpable. *Play Meter*, a coin-op industry trade publication, began its 1982 "state of the industry report" with the headline "Too many games, too many operators… too little revenue." The data was fairly clear, "Overproduction by manufacturers, which as a whole sold 21 percent more equipment in 1982 than in the

[178] Joyce Worley, ed. "Hi, There!" *Arcade Express*, Vol. 1, No. 1, August, 15, 1982, p. 1.
[179] Len Albin. *Secrets of the Video Game Superstars* (New York: Avon Books, 1982), p. 5; Tom Hirschfeld. *How to Master the Video Games* (New York: Bantam Books, 1981), p. 4; Craig Kubey. *The Winners' Book of Video Games* (New York: Warner Books, 1982), p. xv.

record-high year of 1981, and over-saturation of equipment at the location level, brought on by a 33 percent increase in the operator population, teamed up to squeeze the profitability out of the video game business at the operator level."[180] Circumstances worsened in 1983. Many distributors and operators went out of business. As the market for video arcade games declined, manufacturers saw a precipitous dip in profits. Several producers went out of business. Among the casualties was Atari, Inc., the first video game company and for years the top player in the industry.

Stagnation and Saturation

Video arcade game technology stagnated in the early 1980s. Steve Bristow, an influential game developer and vice president of research and development at Atari, noted at a consumer electronics show in 1983 that there wasn't much new coin-op technology displayed. In fact, the only novel video arcade game innovation was a system that converted an Atari VCS home console into a coin-op machine, a questionable invention that Bristow called "schlocky."[181] At the same event the following year he simply noted "the video game area had no new entries."[182] The video game industry had ridden a wave of user interest and sales to mediators through 1982 and was recording record profits without needing to introduce significant innovations. As described by Steven Kent, "With the continuing growth of video games, some executives began to

[180] Lally, November, 1982, p. 43.
[181] "Engineering Notebook." Steve Bristow Papers, Box 2, Folder 8, p. 55.
[182] "CES report, 1984." Steve Bristow Papers, Box 14, Folder 1.

believe that they could sell anything as long as it came packaged as a video game."[183] The result was a significant loss of novelty. As explained by Tim Skelly

> The Great Video Game Industry Crash of the early 1980s threw the game industry to the winds, and I'll take the risk of explaining why. When video games first appeared, they were as novel as novel could be… For several years, we saw tremendous leaps in novelty and gameplay, but by definition all novelty eventually ceases to be novel. Entertainments either disappear as fads or they become part of the landscape, more like templates or platforms for future creations. Put simply, the delight of novelty wanes over time.[184]

As producers increasingly made cosmetic rather than qualitative changes, users began to lose interest.

Coin-op industry operators and distributors were frustrated with lack of innovation being displayed by video arcade game producers. Roger C. Sharpe, a critic for *Play Meter*, wrote in 1982, "Any way you look at it, change is going to have to come if the business is going to grow. It's not going to be enough to rehash old ideas and dress them up. With pinball this was possible for many years but hardly was the audience as sophisticated or knowledgeable as it is now."[185] One distributor complained, "The new games are looking too much alike. There's nothing different that is catching on."[186] Operators therefore increasingly opted to "keep their current games in action rather than

[183] Kent, p. 235.
[184] Skelly, p. 164-165.
[185] Roger C. Sharpe. "Critic's Corner," *Play Meter*, Vol. 8, No. 21, November 1982, p. 64.
[186] Mike Shaw. "One mo' time," *Play Meter*, Vol. 8, No. 19, October 1982, p. 21.

replace them with $3,000 purchases that offer nothing new to the player except a pretty face."[187]

Laserdisc games, first introduced in 1983, were an exception to the general technological and artistic stagnation in the industry, but had problems that affected their economic viability. They utilized optical discs to display detailed, pre-recorded videos in response to player actions. Laserdisc games were capable of producing far greater visual spectacle than their microprocessor counterparts. However, their pre-recorded scenes limited gameplay to a small number of choices and outcomes, and offered few opportunities for strategy. *Dragon's Lair*, released by Cinematronics in 1983, exemplified the genre. It was a great success during its first few months in the arcades largely due to remarkable graphics (fig. 1-18), and there was hope that similar games could buoy the business for some time to come. Unfortunately, both it and other laserdisc games were notoriously unreliable. The first *Dragon's Lair* machines were prone to breaking while being moved. They overheated due to insufficient ventilation and the utilization of laser disc players "not designed for the 'stringent' application they get in arcades."[188] Cinematronics had to slow production and apply fixes, leading to issues with both availability and obsolescent parts.[189] *Dragon's Lair* had a high price tag of around $5,000, and Cinematronics required distributors to pay for the game upfront due to the company's weak finances and the expense of laserdisc technology.[190] After a brief bout

[187] Shaw, p. 21.
[188] Mike Shaw. "Pioneer Disc not Meant for Videos," *Play Meter*, Vol. 9, No. 20, November 1983, p. 15.
[189] Ralph Lally, ed."'Dragon's Lair' Production Slow," *Play Meter*, Vol. 9, no. 17, September 1983, p. 11.
[190] Ralph Lally, ed."Manufacturers Require Money Up Front," *Play Meter*, Vol. 9, No. 17, September 1983, p. 30-31.

Figure 1 - 18: *Dragon's Lair* play screen. Replay Amusement Museum. http://www.replaymuseum.org/games/dragons-lair/ (accessed 5/16/2015)

of popularity, revenues for *Dragon's Lair* fell off due to repetitive gameplay. According to Tim Skelly, even moderately experienced users could play the game to completion.[191] This meant that there was little to maintain user interest over time. Though it made money for Cinematronics due to its initial popularity, it was ultimately a disaster for coin-op industry operators and distributors.

Stagnation in video game design coincided with market saturation. Producers were putting out lots of games, such as best-sellers *Ms. Pac-Man* (1982) and *Tron* (1982), and reaping record profits from a large pool of eager operators. However, the overall quality of new games tended to be low. Rehashes of old ideas and design features failed

[191] Skelly, p. 163.

to keep the attention of many users, making it difficult for operators to recoup purchase or leasing expenses.[192] An Atari developer noted that most games saturated the market in only six to eight weeks, and only a few top games had staying power. The market had changed, and it suddenly it was difficult to be successful.[193]

Moral Panic

Problems within the video game and coin-op industries coincided with a "moral panic." As summarized by Pieter Jacobus Fourie, a moral panic occurs when "individuals and/or groups" "perceive certain activities as seriously subverting the mores and interests of the dominant culture."[194] Mass media disseminates their reactions "in a hysterical, stylized and stereotypical manner, thus engineering a sense of moral panic."[195] Concerned parents asserted that video arcade games were a negative influence on the nation's youth and a threat to the moral fabric of society. A buzz of public concern began when Ronnie Lamm, a mother from Long Island, organized "a very effective grassroots campaign against video games."[196] In 1979 she voiced complaints on *The Phil Donahue Show* and soon was "all over television, accusing video games of undermining American youth and making children numb to violence."[197] In 1982 Christian minister David Hartman warned, "Video games, which are present nearly everywhere these days, are the most blatant

[192] Ralph Lally. "Up Front," *Play Meter*, Vol. 8, No. 22, November 1982, p. 10.
[193] "Engineering Notebook." Steve Bristow Papers, Box 1, Folder 6, p. 61.
[194] Pieter Jacobus Fourie. *Media Studies: Institutions, Theories, and Issues* (Lansdowne, South Africa: Juta and Company Ltd., 2001), p. 295. For other discussions of moral panic, see Stanley Cohen. *Folk Devils and Moral Panics* (New York: Taylor & Francis, 2011); James Watson and Annie Hill. *Dictionary of Media and Communication Studies, 8th Ed.* (New York: Bloomsbury, 2012), p. 185-186.
[195] Fourie, p. 295.
[196] Tom Sito. *Moving Innovation: A History of Computer Animation* (Cambridge: MIT Press, 2013), p. 112.
[197] Kent, p. 119; Sito, p. 112.

testimony we have to American waste."[198] The same year, United States Surgeon General C. Everett Koop publically denounced video games as addictive and harmful (fig. 1-19).[199] A city ordinance against video arcade games in Akron, Ohio stated plainly that "the operation of even amusement-only or similar machines can become and now constitute a nuisance, if there is not adequate regulation, in that it encourages a false sense of values, idling, and loitering."[200] Dunkin' Donuts made a public statement that video arcade games "tend to encourage players to hang out and loiter in order to play" and banned them in part because they were "detracting from the family image sought by

Figure 1 - 19: Cartoon printed following Surgeon General C. Everett Koop's criticisms of video games. Dwane Powell. "Koop-Man," *News & Observer*, November 11, 1982, p. 4A. The C. Everett Koop Papers. National Library of Medicine. http://profiles.nlm.nih.gov/ps/access/QQBBCG.pdf (accessed 5/22/15)

[198] Ralph Lally, ed. "Shot Subjects," *Play Meter*, Vol. 8, No. 21, November 1982, p. 30.
[199] Joyce Worley, ed., "Koop Blasts Videogames," *Arcade Express*, Vol. 1, No. 9, December 5, 1982, p. 1.
[200] Jaffe, p. 17.

the Dunkin Donuts system."[201] In numerous instances, video arcade games were accused of promoting violence, drug use, laziness, loitering, stealing, and/or gambling.

Many of the negative ideas about video games stemmed from pre-existing assumptions about coin-op amusements. As video arcade games proliferated, non-users made sense of them via associations to familiar technologies. For most, this was pinball. The identification of pinball machines as gambling devices associated with organized crime haunted the video arcade game industry. New York didn't lift its ban on pinball machines until 1976, five years after the first commercial video game hit the market. It was only a few years behind Chicago (1973) and Los Angeles (1974). Even then, changes came via successful court battles by pinball manufacturers and enthusiasts rather than a removal of social stigma.

Video arcade games took on the negative social connotations of their coin-op ancestors. As explained contemporaneously by Robert R. Craven,

> Most complaints against video games and arcades can be summed up in language once applied to pinball and pool: they are accused of encouraging youngsters to waste time and money, of attracting undesirable or dangerous hangers-on, and of addicting players to an activity that 'serves no useful purpose,' as the City of New York once said of pinball.[202]

Critics claimed that all video arcade games were a form of gambling with payouts in the form of free plays and high scores.[203] Gamblers' Anonymous discouraged the use of video games because of perceived similarities between the compulsion to gamble and the

[201] Ralph Lally, ed. "Headliners," *Play Meter,* Vol. 8, No. 22, November 1982, p. 38.
[202] Robert R. Craven. *Billiards, Bowling, Table Tennis, Pinball, and Video Games: a Bibliographic Guide* (Westport: Greenwood Press, 1983), p. 129.
[203] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.

compulsion to game.[204] Akron's video game licensing ordinance lumped video arcade games with pinball and stated "the operation of pinball machines and similar machines involving chance or skill or reward encourages gaming… and is a threat or menace to the peace and morals of the community."[205]

Concerned citizens also voiced new complaints specifically related to the violence depicted in video arcade games. Carter Ruth of New London, Connecticut, wrote in her local paper that "video games can cause more violence because certain kids will become addicted to this and might perhaps try to steal money to feed into the machine."[206] Minister David Hartman connected video games to a dangerous mentality towards warfare and asserted "Video games, without malice aforethought, are capable of inducing a subconscious sense that devastation is without consequence. That the only thing needed to set all things right is the insertion of another quarter."[207] Humorist Art Buchwald opined in the *New York Times*, "There are too many people in this country who want to shoot at something. It puts Americans in a very bad psychological frame of mind. It's worse for the kids. They are starting to think that war is a video game, and we can shoot down anything with a quarter."[208] G.F. Cravenson wrote a letter to the editor of the *New York Times* describing video arcade games as "war games," stating "Video games are based on fight-or-flight confrontation, good guy vs. bad guy allegories or just plain

[204] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.
[205] Jaffe, p. 17.
[206] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.
[207] Ralph Lally, ed. "Short Subjects," *Play Meter*, Vol. 8, No. 21, November 1982, p. 30.
[208] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.

explosive shoot-'em-ups. There is nothing friendly about them. The point of every video game is: Destroy the menacing obstacle before it has a chance to destroy you."[209]

American news media were quick to write stories that inflamed these moral concerns. Reported instances of truancy, theft, and addiction involving video arcade games were common.[210] Media treatment was not uniform, and there were instances where video arcade games were defended as positive or innocuous. However, negative stories did a better job of capturing the imaginations of some Americans. In 1982 Ralph Lally, editor and publisher of *Play Meter*, wrote, "It got to a point where video games were being bullied in the national media as the new corruptor of our nation's youth. As time went on, the public outcry against video games had nearly reached epidemic proportions."[211]

Some local groups were effective in limiting, restricting, or even banning video arcade game use. By defining who could use them, when they could be used, where they could be placed, and how many machines could be in a given location, local groups were able to minimize the "adverse effects on the surrounding neighborhood."[212] Babylon, New York, Glendale, California, and Huntington Beach, California, all mandated that video arcades not operate within the vicinity of a school.[213] Akron's provision also included public libraries and playgrounds.[214] Akron and Babylon restricted them from

[209] C.F. Cravenson. "Video Games for the 'Basest Instincts of Man,'" *The New York Times*, January 28, 1982.
[210] Joe Claro, ed. "News Blips," *Blip*, Vol. 1, No. 1, February 1983, p. 20; Martin, p. 2.
[211] Ralph Lally. "Up Front," November 1982, p. 6.
[212] Jaffe, p. 2.
[213] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1; Jaffe, p. 9, 19.
[214] Jaffe, p. 19.

operating with 500 feet of a church.[215] Paramus, New Jersey, prohibited anyone under the age of sixteen from video arcades during "normal school hours."[216] Niskayna, New York, debated mandating that arcades stay closed during school hours, reportedly in emulation of an identical law in Oakland, California.[217] After a drug bust at The Silver Ball Arcade, city officials in Cleveland, Ohio, pursued arcade regulations culminating in a prohibition on video arcade game play by unaccompanied minors.[218] The mayor of Geneva, Illinois, championed a proposal that would ban children between the ages of 12 and 17 from entering an establishment that housed a video arcade game unless accompanied by an adult. He called coin-op games "the marijuana of this generation" and stated that it was "important to confront evil where we find it."[219]

A few areas enacted rules for video arcade game operation that made it nearly impossible for the industry to be profitable. Pontiac, Michigan, made it illegal for minors to use video games in 1981. Several other cities and towns across the United States passed similar legislation.[220] The town of Mesquite, Texas, passed a city ordinance that made it illegal for anyone under 17 to play video arcade games. Several municipalities throughout the U.S. effectively capped (either through outright prohibition or punitive taxation) the number of machines that could be placed in a given location, most commonly at four but at as little as two.[221] Marshfield, Massachusetts, banned all video arcade games in 1982 because "older residents feared the games might lead to rowdiness

[215] Jaffe, p. 9.
[216] Jaffe, p. 14.
[217] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.
[218] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.
[219] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.
[220] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.
[221] Jaffe, p. 2-3, 8.

and drug dealing, and some parents objected to the time and money their children spent on the videos."[222] Boston established strong barriers keep video arcade games out of certain areas for the "good and welfare of the community."[223] Any establishment with even a single video arcade game was legally classified as an arcade, and therefore subject to bureaucratic and zoning procedures, as well as several administrative fees. Upper Moreland, Pennsylvania, prohibited establishments from housing more than three machines, enacted a $200 annual licensing fee for each machine, made it illegal for school-age children to play them during school hours, and gave town officials the authority to perform background checks on video arcade game operators to determine if they or "any of their associates" had criminal records."[224] Following two arcade shootings, Detroit drafted a revised city ordinance to require arcades to have security personnel onsite and to close at 10:00pm on weeknights, 11:00pm on Fridays and Saturdays.[225] Few establishments could afford the limited hours and extra required payroll. Baltimore enacted a per machine fee in 1982 and raised it in 1983.[226] One of the largest video arcades in the city refused to pay and brought the issue to court. Its owner explained, "In 1982, our arcade license cost us $3,000. This year it is $27,000. We may be the only arcade making money in Baltimore, but we wouldn't be if we paid the fees."[227]

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[222] Ralph Lally, ed. "Get Out of Town," *Play Meter*, Vol. 8, No. 20, October 1982, p. 24.
[223] Ralph Lally, ed. "Banning in Boston," *Play Meter*, Vol. 8, No. 21, November 1982, p. 17.
[224] Ralph Lally, ed. "Oh, Thank Heaven, a Victory," *Play Meter*, Vol. 8, No. 22, November 1982, p. 24.
[225] Ralph Lally, ed. "Detroit Council Wants Security Guards," *Play Meter*, Vol. 9, No. 17, September 1983, p. 12-14.
[226] Ralph Lally, ed. "Baltimore Ops Get Better Deal," *Play Meter*, Vol. 8, No. 21, November 1982, p. 19.
[227] Ralph Lally, ed. "Baltimore Ops Fight City Hall," *Play Meter*, Vol. 9, no. 17, September 1983, p. 24.

Though difficult to measure, the moral panic had an undoubted effect on the video arcade game economy. Local resistance made it difficult for the industry to do business in some areas. Licensing procedures could be difficult to navigate, and various fees diminished profits.[228] Several major markets, such as Baltimore, Boston, and Detroit, generated comparatively little revenue for the industry due to anti-video arcade game laws. None of these actions were enough to drive the coin-op or video game industries to crisis, but they coincided with other issues to exacerbate an industry crash.

The Crash

The North American video game crash began late in 1982 and continued through 1983. On December 7, 1982, Atari announced that it expected a ten to fifteen percent increase in sales in the fourth quarter, far lower than the fifty percent increase previously forecast. Warner stock lost nearly a third of its value as concerned investors bailed en masse. By the end of 1983, both the coin-op and video game industries were reeling. The aforementioned issues with stagnation, market saturation, and moral panic corresponded with unfortunate conditions in the larger economy. In the early 1980s inflation had significantly reduced the value of the quarter and reduced the real profit collected by coin-op amusement operators. Players were resistant to paying more than 25 cents, and operators were therefore unable to increase revenue per play session at the rate of inflation.[229] Young male workers, a core demographic of video arcade games, also cut

[228] Jaffe, p. 23.
[229] Wayne McGuire. "The 25-Cent Dragon," *Play Meter*, Vol. 10, No. 10, June 1984, p. 78.

back on expenses because they were "faced both with decreases in their earning power and increases in unemployment caused by palpable economic instability."[230]

Most producers saw a massive decrease in profits. Atari was the largest and most visible casualty of the crash. By the end of 1983 overproduction, especially of *Pac-Man* and *E.T.* cartridges for the VCS, combined with a decline in coin-op sales and overinvestment in coin-op licenses for a total loss of $536 million. In 1984 Warner sold the consumer electronics and computer divisions to Tramiel Technologies, and in 1985 it sold the coin-op division to Namco. Atari never regained its position as a significant player in the video arcade game industry. Smaller developers of both home video games and video arcade games disappeared due to financial pressure. Coleco, the maker of the ColecoVision home console, struggled despite strong sales in the toy business, and the failure of its electronics division contributed to its bankruptcy in 1988.[231] Cinematronics survived the crash due to the brief success of *Dragon's Lair*, but the game's infamous reputation amongst coin-op industry personel, continuing internal financial issues, and a rash of lawsuits kept it from filling the gap left by other failed companies. Skelly remembered, "Cinematronics always seemed to be on the edge of losing everything."[232] It was sold to Tradewest in 1987 and refocused on console software. Bally's Midway amusement games division saw a seventy-seven percent dip in sales between 1982 and 1983. Its operating income fell from a $141 million surplus to a $49 million loss.[233] Though a large and diversified company, Bally's second quarter revenues dropped by

[230] Kocurek, p. 200.
[231] Kent, p. 252-255.
[232] Skelly, p. 164.
[233] Christian Marfels. *Bally: The World's Game Maker* (Las Vegas: UNLV International Gaming Institute, 1998), p. 109.

over $80 million between 1982 and 1983, a decline of nearly twenty percent. Net income fared even worse, falling from $35,225,000 to $5,177,000, a roughly eighty-five percent decline. Bally Chairman of the Board Robert Mullane blamed the "continuing extreme softness in the coin-operated amusement game business" and said that he saw "no firm sign of a turnaround in the market."[234] In 1988 Midway was sold to Williams Electronic Games, which had weathered the 1983 crash comparatively well by focusing on pinball machines.

Coin-op amusement operators and distributors fared no better. Technology stagnation in video arcade games combined with more home video gaming options (both on consoles and computers) to cause some users to spend less money on video arcade games.[235] The number of coin-op industry personnel had increased dramatically during the boom of the Golden Age, and when profits declined there wasn't enough money to go around. John R. Trucano, a distributor/operator in Deadwood, South Dakota, was quoted in the June 1984 issue of *Play Meter*, "The factories, distributors, and operators are all hurting. It's a chain of command type of thing. The fly-by-night operators, or the blue suede shoe boys, are dropping like flies. The old pros are having a tough time making it. The video bubble has burst."[236] Another distributor wrote, "Many of the arcades just rode

[234] Ralph Lally, ed. "Headliners," *Play Meter*, Vol. 9, No. 17, September 1983, p. 34.
[235] As described by an anonymous response to *Play Meter*'s 1983 annual operator survey: "You can say anything you want about home games helping coin-op sales, but my sales dropped twenty percent after Christmas '82 and have not recovered." In 1984 several operators complained that profits for a given video arcade games dropped after a home version of it was released. One implored producers to "not release games to the home market before they have a fair chance on the street." Ralph Lally, ed. "Operators Address Manufacturers, Distributors," *Play Meter*, Vol. 9, No. 20, November 1983, p. 58; Ralph Lally, ed. "Operators Sound off About the Manufacturers, Distributors," *Play Meter*, Vol. 10, No. 20, November 1984, p. 50.
[236] Ralph Lally, ed. "Distributors and Operators Adapt to a Changing Market," *Play Meter*, Vol. 10, No. 10, June 1984, p. 34.

the crest of the fad."[237] When the fad faded many of the mediators new to the industry went under. The coin-op industry population fell as people left the business. Most remaining mediators diversified their business into pinball machines and skill games (darts, pool, etc.) to stay afloat.

Part Six - A Different Technological Paradigm

The 1983 marked the end of an era. Video arcade games never regained the cultural power they had during the Golden Age. They ceased to be the prime medium of video game development, a role that was taken over by home consoles and personal computers. Video arcade games did not disappear from America's technological or cultural landscape. In fact, the medium saw brief resurgence in the early 1990s with fighting games such as *Street Fighter II* (1991) and *Mortal Kombat* (1992). But by the end of 1985, video arcade games were no longer the "technological paradigm" for video games, meaning that they were no longer the primary focus for video game innovation or experience.

Aftermath

1984 and 1985 were slow years for the video arcade game industry. Austerity measures meant that few American companies released new titles. Gene Cramm, Vice President of ShowBiz Pizza Time restaurants, remarked in 1985, "[Video arcade games are] not being shoved at us, as a buyer, like they once were at a rate of 8, 10 or 12 games a month. That's not happening today. We've seen a lot of manufacturers, unfortunately,

[237] Lally, June 1984, p. 27.

that have not been able to survive. Those that have survived are producing a quality product, but not as rapidly nor in as much quantity as they used to."[238] Japanese video arcade game companies were less affected by the 1983 crash than their United States counterparts. As of 1985, Adams Roe of *Computer Gaming World* wrote that "arcade games are not as dead in Japan as they are in the United States."[239] Japanese companies also had not overextended themselves in the home console market as Atari had. The reduction in American sales, while significant, was not enough to drive many out of business. Nintendo remained especially strong due to strong sales of *Mario Bros.* (1983) and the continued success of its *Donkey Kong* franchise.[240]

With few games being made and little profit to be had, both video arcades and the gaming communities around them declined. As described by Kocurek, "The industry Crash of 1983 sounded the death knell for what became a kind of protracted agony for video game arcades in the United States."[241] Some survived but few returned to prosperity. Many mediators abandoned the video arcade model due to its high overhead costs and retrenched into familiar locations, typically routes with a few, carefully chosen games at each location. Most took a cautious approach to future purchases. With video arcades closing and a dearth of new video arcade games being released, users increasingly focused on home consoles and computer games. In May, 1985 *Electronic Games* changed its name to *Computer Entertainment*. Two months later it published

[238] Ed Adlum, ed. "ShowBiz's Gene Cramm Assesses Videos and Their Place in Today's Game Industry," *RePlay*, Vol. 10, No. 11, August 1985, p. 48.
[239] Roe R. Adams III. "Come Cast a Spell with Me," *Computer Gaming World*, Vol. 5, No. 4, September-October 1985, p. 21.
[240] Burnham, p. 356.
[241] Kocurek, p. 192.

thirteen articles. One was on video arcade games, and twelve were on personal computers.[242]

From Coin-op Amusements to Home Electronics

In 1983 Nintendo filled the gap left by Atari and released the Famicom (a contraction of "family computer") home video game console in Japan. It was a remarkable success and shipped over 500,000 units in its first two months.[243] It took two years to reach North America because American businesses were convinced that the economic viability of the video game ended with the 1983 crash. As recalled by consumer affairs journalist Herb Weisbaum, "It seemed like all the print media wanted to keep writing about was the death of video games. I mean, they just loved to write that story. 'Video game sales are dead, video games are gone, video games are history.'"[244] Retailers were hesitant to stock video game hardware and software after suffering losses during the crash. Nintendo eventually had to promise to buy back any unsold systems in order to convince businesses to stock their products.[245] When the Famicom was released in the North America in 1985, Nintendo called it an "entertainment system" rather than a "video game" in order to circumvent the "hostile economic climate" following the 1983 crash.[246] The redubbed Nintendo Entertainment System (NES) saw mediocre sales at first, but following a major marketing campaign went on to be a huge hit and cultural

[242] Louise Kohl, ed. *Computer Entertainment*, Vol. 3, No. 7, July 1985.
[243] Burnham, p. 375; Kent, p. 279-280.
[244] Herb Weisbaum, as quoted in Kent, p. 280.
[245] Greg Fischbach, as quoted in Kent, p 297; Kent, p. 297-298.
[246] Steven E. Jones and George K. Thiruvathukal. *Codename Revolution: The Nintendo Wii Platform* (Cambridge: MIT Press, 2012), p. 26.

phenomenon. After the release of *Super Mario Bros.* (1986) it became the top platform for American video gaming and remained so for the next several years.[247] Eventually, Nintendo sold over 65 million Famicom/NES units worldwide.[248]

The 1985 North American release and subsequent popularity of the NES marked a major shift. The first commercial video games had been coin-op technologies, both economically and socially. Video arcade games had remained the paradigm for innovation even after the video game industry expanded into home electronics. Most games were released as coin-ops before being re-engineered for home consoles, and console hardware was based upon video arcade game hardware. The decline in video arcade games, the success of the Famicom/NES, and an increasing prevalence of home computers changed the technological paradigm.

In the years that followed, video games became something different from their video arcade game ancestors. Despite greater design constraints on graphics, home gaming allowed for greater narrative and scope due to the dynamics of continuous home use. The experience of play fundamentally changed as producers experimented with new possibilities, coin-op industry mediators were cut out of the business, and users transitioned from video arcade communities to solo or small group play in homes.

[247] Malliet and de Meyer, p. 35.
[248] Burnham, p. 375.

Chapter Two - Producers

This chapter examines "producers," defined as actors that undertook and/or oversaw the creation and production of video arcade games. Producers are traditionally central to the history of technology. As originators, their ideas, innovations, and technical decisions have direct effects on the form, function, and meaning of a given technology. Their actions furthermore take place within a messy web of social, economic, and cultural influences that reveal larger historical trends. In this chapter I examine video arcade games from their perspective to identify pivotal moments and key practices. I also consider how interactions between producers and mediators (actors who purchased video arcade games from producers for distribution, placement, and operation) and producers and users (actors who played video arcade games and patronized video arcade game spaces) influenced technological trajectories.

My study presents new archival-based information on video arcade game producers and gives fresh perspective. Of my three categories of actors, producers are the only group that has seen significant attention from amateur histories such as Marty Goldberg and Curt Vendel's *Atari, Inc.: Business is Fun* and Stephen Kent's *Ultimate History of Video Games*.[1] However, I take a critical approach that is lacking in such antiquarian and fan histories. I also utilize previously unexamined primary sources to shed light on significant and untold aspects of the producer story, informing such issues as contingency, the formation of business practices, technological models, gender, and corporate culture.

[1] Marty Goldberg and Curt Vendel. *Atari, Inc.: Business is Fun* (Carmel: Syzygy Company Press, 2012); Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

Part One - Distilling the Producer Perspective

My investigation of the producer perspective focuses on Atari, Inc., the first video game company and the most influential manufacturer from 1972 until shortly after the 1983 North American video game crash. I draw upon the papers of Al Alcorn, who developed *Pong* (1972), served as Vice President of Research & Development at Atari, and sat on the board of directors from 1974 to 1976. His detailed records include meetings of the board, internal memos, financial figures, various company documents, business plans from 1974 and 1975, and the Securities and Exchange Commission (SEC) filings prior to Atari's initial public offering.[2] The SEC report details the company's history, the state of the industry, the forecast target audience for video arcade games, and where Atari hoped to direct its technological and financial future. Alcorn's papers feature additional records up to 1981. Further Atari materials are found in the papers of Steve Bristow, who held several titles at Atari, including Vice President of Engineering and Vice President of Advanced Technology, between 1972 and 1984.[3] The twenty-three box collection includes personal papers, legal documents, manuals and schematics, business

[2] Atari created two business plans at the midpoint of 1974. The first was intended for operators, distributors, and small-scale entrepreneurs. The second had a "limited distribution to institutional investors only" and was not authorized for reproduction. The two plans are identical in most places but differed in their assessment of Atari's financial situation. The regular business plan was bullish on Atari's prospects and aimed to inspire confidence, while the institutional investor business plan emphasized company potential and called it "undercapitalized." Both portrayed Atari in the best light possible, and at times must therefore be treated carefully as historical sources. The plans are primarily valuable as a reflection of how Atari wished to present itself, and how it thought of itself in relation to the rest of the coin-operated amusement industry. Atari, Inc. Business Plans, 1974-1975, Stanford University Special Collections, Stanford University Libraries, Stanford, CA, 1974-1975, Box 1, Folder 2.

[3] Bristow was also the Vice President of Engineering at Kee Games, Inc., an Atari subsidiary. "Atari Subsidiaries: Kee Games, Inc." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1; "Inter-Office Memo: Personnel Announcement, 4/10/1981." Al Alcorn Papers, Stanford University Special Collections, Stanford University Libraries, Stanford, CA,, Box 1, Folder 5.

papers, Atari press packets, coin-operated (coin-op) and electronics industry trade show reports, a set of advertisements and articles, instances of both hardware and software, and several engineering notebooks. The last are especially interesting because they contain insider notes on Atari business meetings, internal practices, and brainstorming sessions for the development of new video arcade games. Published interviews and oral histories with Atari management and game developers (an industry term for someone who designs and implements video games) help to contextualize these documents and illustrate instances of tacit knowledge.

I use Atari as an exemplary case. This is both a practical choice based upon the depth and availability of sources and a reflection of Atari's importance.[4] As the founding company of the video game industry it had a preeminent role in setting models. Choices made by Atari developers, engineers, and executives from 1972 to 1977 in large part determined what video arcade games would be. Atari remained an important innovator even after major competitors rose in the late 1970s and early 1980s. When the quality and originality of its products declined in 1982, it suffered a financial collapse that initiated the 1983 crash. It is therefore the best locus for studying the produce side of video arcade games.

I make some generalizations about producers (developers, managers, and various supporting personnel) at Atari in order to understand some larger trends in video arcade

[4] The rest of the industry left comparatively few records. Small companies, such as Project Support Engineering, Fun Games, Inc., and Universal Entertainment Corporation, were driven out of business by either the 1977 crash or the 1983 crash. To date they have left little public archival record of their existence, beside the artifacts they produced. Most large and mid-size companies, such as Bally/Midway and Williams, have been bought and sold several times since their prominence in the industry. The documentation of these companies' video arcade game business appears to have been lost, or at least is presently unavailable.

game technology, but it is important to note that producers were not a monolith. Atari was a large manufacturer with a distinct work culture, and its personnel tended to fit a particular demographic, but as with any group individuals were more complex and varied than the aggregate. My characterizations of producers are also limited by the dataset. Producers in the Chicago coin-op industry cluster and Japan were both important to the history of video arcade games, but unfortunately there is minimal source material to assess their perspectives and practices.

Based upon available materials, it is possible to formulate a general description of Atari between 1972 and 1981 (when the sources are strongest), and to an extent within the Silicon Valley area that served as the center for the video game industry. Most developers and managers received exposure to cutting-edge computer engineering at leading universities in the western United States. As discussed in the previous chapter, Atari co-founder Nolan Bushnell studied electrical engineering at the University of Utah and was active in the lab of computer graphics pioneer David Evans.[5] Bushnell developed a concept for video arcade games while playing *Spacewar!* (1962) on a PDP-6 minicomputer at the Stanford Artificial Intelligence Laboratory (SAIL) run by Les Earnest. Earnest was an influential computer scientist who had helped design the Semi-Automatic Ground Environment (SAGE) air defense system and was a member of the Advanced Research Projects Agency Network (ARPAnet) start-up committee.[6] The

[5] For more on Evans, see several mentions in Tom Sito. *Moving Innovation: A History of Computer Animation* (Cambridge: MIT Press, 2013). See also discussion of the University of Utah as an influential center of computer graphics in Arthur L. Norberg and Judy O'Neill. *Transforming Computer Technology: Information Processing for the Pentagon, 1962-1986* (Baltimore: Johns Hopkins University Press, 1996).
[6] It is unclear how much (if any) contact Bushnell had with Earnest or other major figures in the history of computing at SAIL, but he was a frequent visitor and friend of senior research assistant Jim Stein. It is

University of California at Berkeley rivaled Stanford as a center for computer research, and Al Alcorn and Steve Bristow received degrees from its combined electrical engineering and computer science department.[7] Not surprisingly, Berkeley was heavily represented in both Atari's coin-op and consumer electronics divisions.[8] Ed Logg, one of Atari's most successful video arcade game developers, received degrees in mathematics and computer science from Berkeley before earning a graduate degree from Stanford, where he was active at SAIL. Educational backgrounds in advanced computer science and engineering at top institutions equipped developers and managers at Atari with the requisite skills to pursue video game innovation.

Several key executives at Atari had professional experience in the coin-op amusement industry.[9] Bushnell had managed pinball machines and electromechanical novelty games at a Salt Lake City amusement park during college, and he often cited the experience as an important part of his business background.[10] After co-founding Atari, he sunk some of the small profits generated by *Computer Space* (1971) into the purchase of

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reasonable to assume that he had some exposure to the lab's computing research, though it may have been limited. Goldberg and Vendel, p. 25.

[7] Allan Alcorn. Oral history by Henry Lowood, Mountain View, CA, April 26 and May 23, 2008. The Computer History Museum, Mountain View, CA.

[8] Goldberg and Vendel, p. 130, 151, 197.

[9] Dabney left Atari shortly after the release of *Pong*, but did help oversee the initial creation and operation of the company's manufacturing division. "The 'classic' Atari management team," which ran the company in various roles from 1973 until several members left or were forced out following the sale to Warner, consisted of Nolan Bushnell (Chairman of the Board), Al Alcorn (Vice President of Research & Development), Steve Bristow (Vice President of Engineering), Joe Keenan (President of Atari-subsidiary Kee Games, Inc., and then later President of Atari after the companies merged in 1975), Gene Lipkin (Vice President of Sales), Bill White (Vice President of Finance), and Gil Williams (Vice President of Manufacturing). Bushnell, Alcorn, Bristow, and Lipkin had experience in the coin-op amusement industry. Keenan did not, and Williams probably did not (his employment history is not represented in the sources, but it is mentioned that before Atari he worked at Ampex, an electronics and digital recording technology company). White may have had experience auditing coin-op amusement companies, but his background was primarily in finance. Goldberg and Vendel, p. 128, 131;Kent, p. 55.

[10] Nolan Bushnell, as quoted in Kent, p. 29; Nolan Bushnell, as quoted in Morgan Ramsay. *Gamers at Work: Stories Behind the Games People Play* (New York: Apress, 2012), p. 18; Goldberg and Vendel, p. 24.

pinball machines and electromechanical driving games. He, Alcorn, and Atari co-founder Ted Dabney operated a small route of coin-op amusement devices in Bay Area bars and restaurants. The resulting cash flow helped fund Atari's first engineering projects. Later, Bristow worked as a serviceman on the route while finishing his degree.[11] Therefore, during the time when Atari was manufacturing the first video arcade games and setting industry models, Atari's Chairman of the Board (Bushnell), its initial head of manufacturing (Dabney), its head of research and development (Alcorn), and its head of engineering (Bristow) had experience as coin-op industry operators and intimate knowledge of industry needs.[12]

Atari employees tended to fit a particular demographic profile. All of Atari's top executives were male, almost all Atari developers were male, and almost all of its graphic designers were male.[13] Though women worked for the company in other capacities (especially on its assembly line), the business strategies, hardware, and software of video arcade games were largely defined by men (with notable exceptions discussed later in this chapter).[14] Most Atari developers were in their twenties or thirties and steeped in San Francisco Bay Area counter culture.[15] According to Alcorn, their youth and cultural backdrop was crucial to Atari's success:

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[11] Goldberg and Vendel, p. 127.
[12] Atari management was less knowledgeable about the internal business structures of coin-op amusement companies, but Gene Lipkin, Vice President of Sales and part of Bushnell's inner circle, had worked at the coin-op start-up Allied Leisure, later renamed Centuri, before joining Atari. Goldberg and Vendel, p. 50.
[13] Carol Kantor, ed. "Behind the Scenes: Atari's Artists," *Atari Coin Connection*, Vol. 2, No. 6, June 1978.
[14] Sonny Albarado. "Realizing fantasies: How Atari builds games," *Play Meter*, Vol. 1, No. 10, October 1975, p. 33.
[15] A famous example of Atari's acceptance of unusual behavior and Bay Area counter culture involves Steve Jobs, the future co-founder of Apple. Jobs got his start at Atari. His colorful history in the company and his production of the hit video arcade game *Breakout* (1976) (through the manipulation of his friend and future Apple co-founder Steve Wozniak), are chronicled elsewhere. For this study it is notable that

> We came from the 60s, and that's important. We learned from the Vietnam War not to trust the government, not to trust authority, so there was this automatic kind of distrust and skepticism and questioning of authority… Why was it done on the West Coast? Why was it done by young people? You have a lot of insight and intelligence and not so much practical experience that you don't know it can't be done....[16]

At least in the early and mid-1970s, unconventional work habits, including rampant and open drug use, were tolerated and in some cases even encouraged.[17] The company preferred to hire new employees "who didn't really have set ideas about the way they were going to do things" and in order to foster creativity.[18] Due to its hiring practices and work environment, the average Atari employee was young, male, and culturally inclined to think outside the box.

Part Two - Envisioning Video Arcade Games

Atari was founded on June 28, 1972 by Nolan Bushnell and Ted Dabney. They met while working at Ampex, a Silicon Valley company specializing in digital and

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despite his eccentricities, open drug use, and notoriously thorny personality, Atari still hired him and kept him on the payroll. In keeping with the ethos of Bay Area counter culture, Atari accepted and even encouraged behavior outside of common societal norms. When Jobs, a college dropout with minimal knowledge of electronics, walked in off the street and demanded a job, Alcorn gave him a position in engineering. When Jobs said that he wanted to leave the company to meet a guru in India, Alcorn flew him to Germany on business because he "figured it would be cheaper to get to India from Germany" than from California. When Jobs returned from India several months later, Alcorn gave him his job back on request. Kent, p. 69-75. See also Albarado, October 1975, p. 34; Walter Isaacson. *Steve Jobs* (New York: Simon & Schuster, 2013), p. 42-54.

[16] Allan Alcorn. "First-Hand: The Development of Pong: Early Days of Atari and the Video Game Industry." IEEE Global History Network: http://ieeeghn.org/wiki6/index.php/First-Hand:The_Development_of_Pong:_Early_Days_of_Atari_and_the_Video_Game_Industry (accessed 5/28/15).

[17] These tendencies were gradually phased out under Warner management beginning in 1978, when Warner executive Manny Gerard brought in Ray Kassar to provide "adult supervision" at Atari. Kassar became Atari CEO after Gerard forced Bushnell out in November of 1978. Goldberg and Vendel, p. 319-320.

[18] Albarado, October 1975, p. 34.

electronic recording technologies, and formed a strong friendship around playing games such as chess and "go."[19] After developing the idea for a coin-operated version of *Spacewar!* (1962), they left Ampex to join Nutting Associates, a small coin-op amusement manufacturer in Mountain View, California.[20] In 1971 they collaborated to create *Computer Space*, one of the first two video arcade games. Though not a great commercial success, it did provide proof of concept. After its release Bushnell and Bill Nutting, the owner of Nutting Associates, clashed over money and the creative control over future video arcade games.[21] As a result, Bushnell and Dabney left Nutting Associates to start their own coin-op engineering business.

In the beginning, Atari's founders had no sense that their company would be the pioneer of a new form of popular media. There was nothing about *Computer Space* that suggested video arcade games would become a mass culture phenomenon. There was nothing in the technology that suggested it would encourage innovations in programming and graphics, nor that it would increase public engagement with computer technologies many fold.[22] Bushnell and Dabney's visions for Atari did not initially involve manufacturing and, despite the attention paid to Atari's role in the rise of home consoles, did not involve home video games.[23] Atari's eventual status as a video game

[19] Samuel F. (Ted) Dabney. Oral history by Chris Garcia, Mountain View, CA, July 16, 2012. The Computer History Museum, Mountain View, CA; Goldberg and Vendel, p. 24.
[20] Bushnell negotiated a contract with Nutting Associates and left Ampex several months before Dabney, who waited until he was sure that *Computer Space* (1971) could be a viable product. Dabney, July 16, 2012.
[21] Goldberg and Vendel, p. 58.
[22] Ralph H. Baer, "The Father of TV Games," in Van Burnham, ed. *Supercade: A Visual History of the Video Game, 1971-1984* (Cambridge: MIT Press, 2001), p. 18.
[23] Home video gaming and the Atari VCS are emphasized in most historical accounts of the history of video games, both professional and amateur. See, for example, Nick Montfort and Ian Bogost. *Racing the*

manufacturing company was highly contingent, and none of it was an inevitable consequence of a "revolutionary" technology.

Initial Ideas

Bushnell and Dabney envisioned Atari as an engineering consulting firm rather than the complex manufacturing, marketing, and consumer technology company it became. Both had been educated, trained, and employed as electronics engineers. Though each had some work experience outside of engineering (Bushnell in construction, coin-op, and marketing; Dabney in the military), neither had significant entrepreneurial or managerial experience.[24] They were not well-equipped to run a multi-million dollar company, to say the least. In the beginning Atari had neither the capital nor the facilities to properly manufacture the coin-op amusements it hoped to design. It was common practice for coin-op amusement manufacturers to license technologies and designs from third-party developers, and Bushnell and Dabney planned Atari to fill this pre-existing industry role. As described by Bushnell, "… when we started, we thought of ourselves as a design and licensing house. We thought we would be guys who would provide a service to other big manufacturers, and we didn't initially intend to go into manufacturing."[25]

Beam: The Atari Video Computer System (Cambridge: MIT Press, 2009); Joost Raessens and Jeffrey Goldstein, eds. *Handbook of Computer Game Studies* (Cambridge: MIT Press, 2005); Ramsay.

[24] Bushnell's own accounts of his entrepreneurial experience vary. In a 1975 interview, Bushnell said that Atari was "definitely the first company I've ever run." However, in later interviews he mentioned briefly running a cement contracting business following his father's death (when Nolan was only fifteen), starting a television repair company in his teens, and founding an advertising company while in college. Whatever the truth of the matter, it's unlikely that these experiences would have properly trained him to run a large company. Albarado, October 1975, p. 34; Bushnell, in Ramsay, p. 19; Kent, p. 28.

[25] Bushnell, as quoted in Ramsey, p. 24.

Atari got its start with a development contract from Bally, an industry-leading coin-op device manufacturer based in Chicago. In April of 1972, Nutting Associates flew Bushnell to Chicago to teach technicians at Empire Distributing, a major coin-op distribution company, how to service *Computer Space* machines. Using his budding coin-op industry connections, he orchestrated a meeting with John Britz, who was Bally's Executive Vice President of Technology.[26] The potential of video arcade games intrigued Britz, and Bushnell also pitched him some innovative ideas for new pinball machines. The resulting contract both allowed for the creation of Atari, since monthly payments helped pay for living and business expenses, and necessitated it, since Bally refused to work with Bushnell while he was still directly employed by one of its competitors.[27]

The Bally-Atari contract illustrates that Atari did not consider itself a video arcade game manufacturer. In fact, it didn't even consider itself a video arcade game company. In 1972 Atari's business was developing coin-op amusements, not just video arcade games. Atari's agreement with Bally was to develop a video arcade game, a pinball machine, and some form of novelty game.[28] The pinball machine was the higher priority, and Dabney quickly set to work on engineering it while Bushnell dealt with business logistics and attempted to start other projects.[29] The game, called "Transition," featured three separate playing fields and may have been the first multi-level pinball machine.[30]

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[26] Goldberg and Vendel, p. 59.
[27] Goldberg and Vendel, p. 59, 61.
[28] Alcorn, IEEE Global History Network.
[29] As described by Dabney, "My job was to design the pinball machine. It was an important part of the contract." Dabney, July 16, 2012.
[30] Bally purchased the design, but for unknown reasons never put the game into production. Bushnell, as quoted in Ramsay, p. 27.

Atari's business concept was to create innovative coin-op amusements, and "Transition" fit that model. Video arcade games were only part of Atari's business model.

Pong and Opportunity

Atari's shift from an engineering consulting firm to the first video arcade game company happened by accident. In Atari's first days Dabney was working on the "Transition" pinball machine for Bally, while Bushnell was engineering a modified version of *Computer Space* (1971) to fulfill a second contract with Nutting Associates.[31] Atari still needed someone to help develop the video arcade game part of the Bally contract. With this in mind, Bushnell approached Al Alcorn, a young Ampex employee who had interned in Bushnell and Dabney's division. Bushnell gave Alcorn a hard sales pitch about joining Atari and offered him a salary plus a ten percent stake in the company to leave his current position. Bushnell may have thought of Alcorn because he was a good engineer with a background in both electrical and computer engineering, or he may have just been looking for a recent college graduate with an inexpensive salary.[32] As luck would have it, Alcorn was disenchanted with Ampex due to a recent reorganization and

[31] Unbeknownst to Bushnell, Nutting Associates had contracted another engineer to produce a two-player version of *Computer Space* (1971). Bill Nutting eventually rejected Atari's design in favor of its competitor. Alcorn, IEEE Global History Nework; Bushnell, as quoted in Ramsay, p. 19; Goldberg and Vendel, p. 76.

[32] I uncovered no comments by Bushnell on why he recruited Alcorn. His generous (and, as it turned out, unnecessary) offer of a ten percent stake in Atari suggests that he was impressed with Alcorn's abilities. But according to Alcorn "I suspect he hired me because I was cheap… Remember, both Nolan and Ted were Electrical Engineers, and I'm this junior guy, you know? I'm the low man on the totem pole, and I think the main feature is that I was cheap, right? …I'm sure he would have loved to have hired the professionals back there (at Ampex), the real greats, but he couldn't afford them. Why would they leave, you know? So I was what he got…" Both interpretations may be accurate. Alcorn, April 26 and May 23, 2008.

round of layoffs.[33] He agreed to join Atari, and Bushnell set him to work on a simple table tennis game. The result, as detailed in chapter one, was *Pong* (1972). It was intended to be a practice exercise to familiarize Alcorn with video arcade game engineering, but the finished product impressed Bushnell and Dabney.[34] They decided to test it on location at Andy Capp's Tavern near Stanford University, and it quickly proved an immense and surprising success. Seeing an opportunity, Bushnell convinced both Bally and its Midway subsidiary to decline the contractual option to license *Pong* by suggesting to each side that the other had found a fundamental flaw in the game and was no longer interested in it.[35] Atari set up its own manufacturing operation to produce the game.[36]

Atari embraced an identity as a video arcade game company after it started manufacturing *Pong*. For the next three years it fully devoted its efforts to video arcade game development. After the release of *Home Pong* (1975), a consumer electronic version of *Pong*, and the Atari Video Computer System (VCS) home console in 1977, Atari became a general video game company active in both coin-op and consumer electronics.[37] Though Atari went on to manufacture several solid-state pinball machines

[33] Alcorn, April 26 and May 23, 2008; Al Alcorn, as quoted in Kent, p. 40.
[34] Accounts on this point vary. Dabney remembers a "knock down drag out argument" with Bushnell over turning *Pong* (1972) into a commercial product, possibly because Bushnell knew he had plagiarized the idea for it from a similar game on Ralph Baer's Magnavox Odyssey. However, Bushnell claims to have seen promise in the game and to have suggested using it to fulfill part of the Bally contract. Alcorn recalls something similar, and remembered Bushnell also having the initial idea to test *Pong* (1972) on location at Andy Capp's Tavern. Alcorn, IEEE Global History Network; Bushnell, as quoted in Ramsay, p. 28; Goldberg and Vendel, p. 71.
[35] Alcorn, IEEE Global History Network; Kent, p. 45.
[36] Dabney claims that it was his idea to manufacture *Pong* and that he took the lead in convincing Bally/Midway to pass on licensing it, but Bushnell and Alcorn both attribute the idea and its execution to Bushnell. Alcorn, IEEE Global History Network; Bushnell, as quoted in Ramsay, p. 28, Goldberg and Vendel, p. 76-78.
[37] Kent, p. 80-81.

beginning in 1976 and branched out into personal computing in 1979, these projects formed a comparatively small part of the business. The circumstances underlying Atari's video game company status and its success were highly contingent. *Pong* may have been the "killer-app" of its day, but the forces that contributed to its development and manufacture were contingent to a unique set of unforeseen events.

Part Three - A New Technology, an Old Industry

A great deal changed at Atari in the years immediately after *Pong*. Fueled by strong sales of *Pong* and its variants (such as the Atari products *Pong Doubles*, 1973, and *Quadrapong*, 1974), it grew from a small engineering company to a major video arcade game manufacturer in a matter of months. By the midpoint of 1974 Atari had 345 employees, up from four in October of 1972, and 85,000 square feet in "administrative, manufacturing, and warehouse facilities."[38] It sold products in twenty-one countries and local manufacturing contracts in nine.[39] It hired more engineers and set them to work developing new products.[40] As its business expanded, its management changed. Bushnell bought out Dabney's share of the company in February of 1973.[41] He became Atari's

[38] "Overview." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[39] Other than the U.S., Atari had contract manufacturing in "France, Spain, Italy, the United Kingdom, the Republic of South Africa, Venezuela, Australia, and Korea." "Overview." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1; "The Company." Atari, Inc. Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[40] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[41] Bushnell and Dabney tell different stories about the buyout. According to Bushnell "Dabney was a good engineer, but he was really not good at being an executive." Atari had gotten "too big for him," and Bushnell felt that they "had to part." He therefore pressured Dabney into accepting a lucrative buyout. But according to Dabney, Bushnell became egomaniacal as the business grew. He eventually came to view Dabney "with contempt and as an obstacle in the way of his personal future, his potential fame and fortune" and forced him out with a series of "unconscionable threats." Bushnell, as quoted in Kent, p. 55; Bushnell, as quoted in Ramsay, p. 32; Dabney, July 16, 2012; Goldberg and Vendel, p. 94-95.

"King" and appointed several hand-picked executives, including Alcorn and Bristow, to help run the business.[42]

Video arcade games became a genre of technology within the greater coin-op amusement industry.[43] The sector had its origins in the 1930s following the invention of the first pinball machine and expanded in the 1950s due to the popularity of jukeboxes.[44] By the 1970s it was producing a variety of mechanical and electromechanical devices, such as pool tables, trivia machines, kiddie rides, etc. The coin-op amusement industry was neither particularly large nor particularly lucrative, and its products were typically side attractions in carnivals, boardwalks, bars, and various other spaces. Nonetheless, there was money to be made from a steady demand for novel machines.

Atari's status as a coin-op amusement company is understudied. Existing histories recognize pinball machines and other coin-op devices as the ancestors of video arcade games, but few investigate the implications of the relationship.[45] The common assumption is that video arcade games were a new and autonomous technology that marked a radical break with what came before.[46] The reality is more complex. In the early and mid-1970s producers saw themselves as introducing a new technology to an old industry. They conceptualized their business and the games they developed as largely falling within the boundaries of coin-op amusements, and new approaches were developed in direct reference to established coin-op models. Coin-op amusement industry

[42] Kent, p. 55.
[43] Alcorn, IEEE Global History Network.
[44] For a brief overview of early coin-op amusements, see chapter one, "Precursors."
[45] See, for example, Goldberg and Vendel; Kent; Kocurek.
[46] Burnham, p. 23.

structures, models, and practices were important considerations and had significant effects on early video arcade games.

Atari took on some of the pre-existing economic, social, and cultural aspects of the coin-op amusement industry. It followed many traditional business channels to engage the coin-op industry operators and distributors that bought its games. Advertisements for video arcade games were placed primarily in industry trade publications such as *Cash Box* and *Vending Times*, and later *Play Meter* (beginning in 1974) and *RePlay* (beginning in 1975). The annual meeting of the Music Operators of America (MOA), the largest association of coin-op industry personnel, was the primary venue for showcasing new Atari products. Despite these traditional practices, Atari did not simply take an entirely imitative approach. It had things to learn and gain from the coin-op amusement industry, but it would have to overcome some of the sector's failures and limitations if video arcade games were to reach a broad audience.

Sales and distribution adhered to coin-op industry routines even though exclusive licensing practices (agreements that a producer would sell only to a single distributor within any given geographical region) were a barrier to Atari's business. To overcome this distribution problem, Atari created a second company called Kee Games, Inc. Kee Games manufactured Atari games, sometimes all the way down to circuit boards bearing the Atari logo, and sold them under different names to create an illusory competitor. Atari perpetuated the ploy by accusing Kee Games of stealing ideas and staging mock confrontations at trade shows.[47] As recalled by Alcorn, "[We used to complain about Kee Games.] "Oh those bastards," you know, we'd bad mouth them. They [the distributors]

[47] Alcorn, IEEE Global History Network.

just loved it 'cause they thought we were all crooks anyway, and they loved the idea of being able to go around us."[48] Kee Games allowed Atari to sell to additional distributors, enabling it to "broaden market penetration," "Dominate each geographic marketplace with maximum exposure," and "Utilize the financial resources of two powerful distribution efforts to fuel the company's growth."[49] Atari boasted in 1975, "Through the creation of a subsidiary selling under another brand name, Atari was able to achieve dual distribution in most markets and currently has one of the strongest Distributor networks in the industry."[50]

Video Arcade Games and Other Coin-op Amusements

Other coin-op amusement technologies served as models for video arcade game development. Despite similar audiovisual elements, movies and television shows were not treated as models. At least after the release of *Pong*, the computer games running on minicomputers were also not seriously considered. Emulating them with fidelity was too expensive, and their underlying hacker ethos was typically incompatible with commercial products.[51] Instead, Atari producers drew upon the technological characteristics and design philosophies of other coin-op amusements and modified them in accordance with the capabilities of video arcade game technologies. The resulting negotiated practices

[48] Alcorn, as quoted in Kent, p. 66.
[49] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[50] "Summary." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[51] Using minicomputers to create video arcade games was considered and abandoned by Bushnell and Dabney, and carried out without commercial success by Bill Pitts and Hugh Tuck in *The Galaxy Game* (1971), as detailed in chapter one, "The First Video Arcade Games." Reducing a computer game down to less expensive components and simplified gameplay had been a mild success with *Computer Space*, but the game was overshadowed by *Pong*. In comparing the two, Bushnell came to believe that *Computer Space* was too complex and wouldn't draw in a "workingman's bar." Bushnell, as quoted in Kent, p. 34.

influenced technological development via tacit agreements of what a video arcade game should be.

Atari's business plan for fiscal year 1974-1975 details how it viewed video arcade games in relation to other coin-op amusements.[52] It identified four technological categories. Pinball machines were the cheapest, ranging from $500-$700 wholesale and $600-$900 retail. "Table games," referring to competitive coin-operated games such as pool and foosball, were more expensive at around $1000 wholesale and $1,300 retail. "Arcade and novelty games," which referred to a variety of specialized amusement machines ranging from shooting galleries to electromechanical horse races, were even more expensive at roughly $1,300 wholesale and $1,750 retail. Video arcade games fit somewhere in the middle at $800-$1,300 wholesale and $1,100-1,750 retail.[53] Jukebox machines, which formed a major (but declining) segment of the industry, and non-competitive coin-op devices (fortune telling machines, gambling devices, etc.) were absent from Atari's analysis; probably because they were not games and presumed to operate under different social and technological criteria.

In analyzing the industry Atari found several features common to coin-op amusements. The coin-op model necessitated that a single play be relatively short for an average player.[54] Games therefore had to be timed experiences or challenging enough to

[52] This was Atari's first business plan and was heavily influenced by the company's experiences in 1972 and 1973. Bushnell, as quoted in Ramsay, p. 20.
[53] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[54] Martin Jaffe. *Regulating Video Games* (Chicago: American Planning Association, 1982), p. 1; Carly A. Kocurek. "Coin-Drop Capitalism: Economic Lessons from the Video Game Arcade," in Mark J.P. Wolf, ed.. *Before the Crash: Early Video Game History* (Detroit: Wayne State University Press, 2012), p. 203; George Sullivan. "Screen Magic," *Blip*, Vol. 1, No. 6, July 1983, p. 4.

defeat players quickly, within about 90 seconds for a beginner.[55] However, they could not be so challenging or complex that they intimidated potential new users.[56] Novelty and spectacle through gameplay, effects, and/or cabinet design were commonly utilized to garner interest and attract a user base.[57] Atari also concluded that successful coin-op amusements tended to be mediums for competitive social interactions. The psychological drive was most evident among table games, most of which fostered direct player-versus-player competition, and also present in the high-score functions of pinball machines and the skill or chance based mechanics of arcade and novelty games.[58] Atari identified this dynamic as a core motivation for play and adopted it as a fundamental design goal.[59]

Atari identified pinball machines as a model for the technical and gameplay design of video arcade games. Pinball was popular in the United States (despite being illegal in New York, Chicago, and Los Angeles), reportedly accounting for the largest part of the roughly $3 billion dollar coin-op industry in the early 1970s.[60] Atari noted that pinball machines had "a long history of stable earnings power and player appeal."[61] They were carefully calibrated to be easy to try but difficult to master, and rewarded frequent play with a slow but steady skill progression. The incremental reinforcement generated consistent revenue from a small but dedicated user base. Atari saw the value of this design and used it as a cornerstone of video arcade games in the future. Instructions and

[55] Sullivan, July 1983, p. 4.
[56] Tim Skelly. "The Rise and Fall of Cinematronics," in Wolf p.161.
[57] Each of these elements is listed by Steve Bristow in the notes for an Atari coin-op division brainstorming session. "Engineering Notebook." Steve Bristow Papers, Stanford University Special Collections, Stanford University Libraries, Stanford, CA, Box 1, Folder 6, p. 60.
[58] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[59] "The Company." Atari, Inc. Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[60] "A Red-Hot Market for Video Games." *Business Week*, November 10, 1973. Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[61] "The Markets." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

game controls were deliberately kept simple so that new users could quickly and easily understand the game.[62] Difficulty increased over time and was carefully calibrated to balance "frustration and reward."[63] Repeat play resulted in greater skill (primarily the recognition of parameters and patterns, but also faster reflexes), which in turn awarded the player with longer periods of play for a single payment. The cycle reinforced itself and encouraged continued use.

However, Atari rejected two aspects of pinball machines in early 1970s.[64] First, it disliked the conservative technological approach displayed by pinball manufacturers. By Atari's estimate pinball machines had "experienced little technological innovation over the last forty years."[65] They were no longer novel, nor did they have an intriguing aura of high-technology.[66] Such stagnation was anathema to Atari's management.[67] Second, Atari avoided incorporating many moving parts into video arcade games. The numerous pieces and components of pinball machines were an advantage to manufacturers because

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[62] Skelly, in Wolf, ed., p.161.

[63] *Pong* notably featured increasing difficulty, though not born of any particular technological philosophy (other than the need to make use enjoyable). As described by Alcorn, "Since Nolan [Bushnell] told me that it had to be a consumer product, I reasoned that the game would be uninteresting if the ball just had one horizontal speed. Two guys could sit there and play it forever. And that would not be much fun. So I added the speed-up. There was a counter in there. After a certain number of volleys it would go faster and then faster yet." Increasing difficulty as a core design philosophy came later. Alcorn, IEEE Global History Network. See also "A Red-Hot Market for Video Games." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

[64] Pinball changed considerably in the mid-1970s with the incorporation of solid state electronics, largely as a result of electronics techniques permeating the coin-op amusement industry through video arcade games. The complaints voiced by Atari in 1974 were therefore less relevant by 1976 when the company started innovating and manufacturing pinball machines. Ralph Lally, ed. "Survey, '76," *Play Meter*, Vol. 2, No. 8, August 1976, p. 20.

[65] "The Markets." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

[66] "A Red-Hot Market for Video Games." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

[67] As stated by Bushnell, "*Pong*'s initial success funded substantial research and development projects which will make our future years even more exciting. New games will be more challenging, more stimulating and more sophisticated. Atari's position at the apex of game technology will continue." "Atari: Playing with the Future." Atari, Inc. Business Plans, 1974-1975. Box 1, Folder 1; "The Markets." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

demand for replacement parts created steady revenue streams. However, they were bad for coin-op industry personnel because broken components meant time periods when a machine generated no revenue. Atari eschewed the numerous mechanical and electromechanical components of pinball machines in the hopes that lower maintenance requirements would be a selling point, ultimately banking on increased sales of new machines rather than continual sales of replacement parts. It therefore pursued designs for video arcade machines with minimal moving parts by comparison to other coin-op amusement technologies and heavily advertised the advantages of "solid state circuitry which maximizes function capabilities, minimizes down-time, and simplifies repair."[68] For example, *Jet Fighter* (1975) advertisements boasted that "solid-state circuit reliability means minimum down-time, less frustration for players and your customers." *Shark JAWS* (1975) similarly stated "built-in solid state reliability means less down-time, less service hassle, more continuous income."[69]

The "arcade and novelty equipment" identified in Atari's business plan served as a negative model for technological construction and innovation, but positive one for gameplay design. Atari described these technologies as "typically bulky, expensive opto or electro-mechanical pieces" and noted that they had "seen only nominal technical innovation over the years."[70] Arcade and novelty equipment also had limited commercial appeal because their large spatial footprint limited them to "arcade and amusement park

[68] "Qwak Service Information and Schematics, 1974". Steve Bristow Papers, Box 4, Folder 5, p. 1. Similar statements were consistently made in video arcade game flyers.
[69] "*Jet Fighter*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=540&image=2 (accessed 5/17/2015); "*Shark Jaws*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=979&image=2 (accessed 5/17/2015).
[70] "The Markets." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

locations."[71] However, Atari praised the experiential design qualities common to the category, writing "an arcade or novelty game encapsulates the dramatic or dangerous human activity on a scale which gives the player a sense of adventurous confrontation. Racing games, war games, target shooting… all fall into the category."[72] Despite serious limitations, arcade and novelty equipment therefore had value as model for game design. Arcade and novelty equipment often succeeded in simulating activities in ways that pinball machines and other coin-op amusements did not. Atari strove to produce good simulations and notably focused some of its early efforts on developing racing games, war games, and targeting shooting games.[73]

In total, Atari's analysis of the coin-op amusement industry helped define the social and technological paths of video arcade games. In evaluating other coin-op amusement technologies, coin-op industry personnel priorities, and patterns of use, it made value judgements about the technological and social aspects of their products. Their choices established models for what video arcade games were and what they were not. These models were negotiable but nonetheless generated technological momentum, meaning that they shaped future iterations through a series of established relationships, expectations, and assumed parameters.[74]

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[71] Atari noted that they therefore "get about 10% of the market for new game equipment sales." "The Markets." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[72] "The Markets." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[73] See, for example, *Gran Trak 10* (1974), a racing simulation that Atari spent large amounts of money developing; *Tank* (1974), a popular war game; and *Qwak!* (1974), a duck hunting simulation. See also "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[74] Thomas P. Hughes. "Technological Momentum," in Merritt Roe Smith and Leo Marx, eds. *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge: MIT Press, 1994), p. 108.

Though some of the technological and thematic characteristics of video arcade games changed over the years, several of the initial decisions made by Atari held. Nearly all video arcade games fostered competition, either through player versus player designs or high scores, and were therefore social technologies. With a few exceptions, they utilized few electromechanical parts and had compact designs. Barriers for initial use tended to be low and games became harder the longer they were played. Good simulation continued to be a seen as a virtue, and racing, war, and shooting were common themes.

Perceptions of Early Video Arcade Games

Even as Atari looked to the coin-op amusement industry for models, it also sought to overcome coin-op industry reputations that threatened to limit the market for video arcade games. As discussed in chapter one, coin-op amusements had perceived connections to gambling and organized crime. Producers and coin-op industry personnel alike were often assumed to be crooks, especially on the East Coast. Though the actual influence and prevalence of organized crime in the industry was exaggerated, it did exist and it did affect coin-op amusement companies. Rumors, investigations, and news reports linked Bally to the mafia. Bally part-owner and CEO William O'Donnell was indicted by a Federal grand jury in 1971 on illegal gambling charges, but was eventually acquitted. He was nearly forced to resign in 1975 when the Nevada Gaming Commission hesitated to approve a license for Bally to operate in the state due to "past business practices and associations," a tacit reference to organized crime connections.[75] When Bally applied to

[75] Ralph Lally, ed. "Nevada Gaming Commission allows Bally officers to keep positions," *Play Meter*, Vol. 1, No. 5, April 1975, p. 46.

operate a casino in Atlantic City in 1978, a subsequent investigation by New Jersey regulators discovered that O'Donnell had ties to prominent mobsters. Further inquiries revealed that in 1968 he had bribed local legislators in Kentucky and at least one U.S. Senator to support the relaxation of gambling restrictions. The commission refused to grant Bally's license while O'Donnell was still involved in the company, which forced him to resign and relinquish share-holder's rights in 1979.[76]

The bad reputation of coin-operated amusements haunted Atari's business. Some banks assumed Atari was involved in criminal activities and refused to discuss loans.[77] At a dinner hosted by Advanced Automatic Sales, a San Francisco coin-op distributor, Alcorn and his wife were threatened over Atari's coin-op amusement route. Alcorn recounted, "We were sitting at a table with another couple, but older. We introduced ourselves. He said, 'Oh, you're from Atari.' And he then reached into his pocket and pulled out a pistol, put it on the table, and said, 'You know, you're operating in my territory.'"[78] Alcorn was shaken by the experience and refused to attend future distributor meetings.[79] Deserved or not, perceptions of criminality meant that coin-op amusement operators typically placed machines in a small number of established spaces (many of them with seedy reputations) because coin-op amusement devices and their operators were generally unwelcome elsewhere. None of these things were good for Atari's business or for the future prospects of video arcade games.

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[76] The Casino Control Commission. "In the Matters of the Application of Bally's Park Place, Inc., a New Jersey Corporation, for a Casino License and the Application of Bally Manufacturing Corporation, a Delaware Corporation, for a Casino Service Industry License," March 16, 1981. http://njlegallib.rutgers.edu/legallib/njar/v10/p0356.pdf (accessed 4/9/14).
[77] Alcorn, IEEE Global History Network; Kent, p. 50-51.
[78] Alcorn, IEEE Global History Network. See also Alcorn, April 26 and May 23, 2008.
[79] Alcorn, IEEE Global History Network.

Atari deliberately distanced itself from the bad connotations of the coin-op industry by engineering the outward appearance and sound design of video arcade games to be different than those utilized by other coin-op amusements. It criticized games that "were noisy, with flashing lights, gongs and whistles, often garishly decorated, and always suspect" due to assumed connections with gambling.[80] These machines were "frowned on in the more sophisticated environments" and therefore limited to "arcade, sports center, tavern, and café locations."[81] In contrast, Atari created video arcade games to be "typically quiet, compact, and discreetly packaged."[82] Though the description might give modern readers pause, in 1974 the characterization was accurate. Video arcade games took up less space than pinball machines, arcade and novelty games, or table games. Their electronic beeps were quiet by comparison to the cacophony of most peer technologies. Early video arcade game cabinets typically featured simple graphic designs and minimal artwork (fig. 2-1). Video arcade games were made to be understated when placed next to other coin-op amusements, and this choice gave the technology a different status (fig. 2-2).

The technological perceptions constructed by Atari contributed to the initial popularity of video arcade games. Traditional markets such as arcades, pool halls, midways, and bowling alleys were receptive to video arcade games because they had already been conditioned by pinball and other previous, similar technologies. Coin-op amusement operators tapped these locations with relative ease, but also found that video

[80] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[81] "The Markets." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[82] "Atari: Playing with the Future." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

Figure 2 - 1: *Pong* utilized a "low key cabinet, suitable for sophisticated locations." It featured no artwork and simple wood paneled siding. "*Pong*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=795&image=1 (accessed 5/17/2015)

Figure 2 - 2: A *Pong* cabinet (left) as compared to a *Fireball* (1972) cabinet, which was one of the most popular pinball machines of the early 1970s. The International Arcade Museum. http://www.arcade-museum.com/images/118/118124215256.gif; http://www.arcade-museum.com/images/124/1247892353.jpg (accessed 5/17/2015).

arcade games appealed to new spaces and demographics.[83] The high-tech glamour of computer technology combined with relatively inconspicuous design elements to open doors that were closed to other coin-op amusements. Though video arcade games did not maintain their sophisticated image for long (a subject covered in greater depth in chapter three), in the mid-1970s they had made significant inroads in spaces such as hotel

[83] "A Red-Hot Market for Video Games." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1; Gene Beley and Sonny Albarado. "Cocktails, anyone? The boob tube pays off," *Play Meter*, Vol. 1, No. 5, April 1975, p. 26; "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1; Geoffrey R. Loftus and Elizabeth F. Loftus. *Mind at Play: The Psychology of Video Games* (New York: Basic Books, 1983), p. 7-8; "Overview." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

lobbies, airports, movie theaters, and shopping malls.[84] The opening of new markets generated profits for Atari, created more opportunities for use, and gave greater visibility to video arcade games.

Part Four - Business Practices and Model Setting at Atari

In the formative years of 1973 to 1976, Atari established business practices and set models that had lasting effects. Video arcade games were a new technology, and though many companies rushed to produce their own clones of *Pong* few attempted to innovate.[85] In fact, for several years reverse-engineered copies of Atari games were the industry norm.[86] Atari was therefore in a unique position to shape approaches and ideas. Its choices therein established expectations for how video arcade games were developed and made.

Manufacturing

The success of *Pong* created manufacturing problems for Atari. It was difficult to fill consumer demand due to a shortage of manpower and facilities, and *Pong* clones released by other companies siphoned dollars away from Atari's business. The company's initial manufacturing was disorganized.[87] Board burning, wire harnesses, and

[84] "Overview." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1; "Market Development." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[85] Kent, p. 61.
[86] Sonny Albarado. "Silicon Gulch cowboys aim to be top guns of games," *Play Meter*, Vol. 1, No. 10, October 1975, p. 31-32; "Atari, Inc. v. Mar-Quin Company, Inc.: Declaration of Steven Bristow, 11/24/75" Steve Bristow Papers, Box 3, Folder 2.
[87] Goldberg and Vendel, p. 102.

final game assembling took place in an abandoned roller-rink near Atari's main office.[88] Atari was undiscerning in its factory hiring practices due to a desperate need for labor. In hindsight, too much of its initial workforce consisted of, according to Bushnell, "members of motorcycle gangs and people who found that they could fence the televisions and buy heroin."[89] Drug use and theft were rampant.[90] In the meantime, significant amounts of Atari money went into equipment and transportation, while even more went to renting, buying, and/or maintaining facilities.[91] Developing cheaper and more efficient manufacturing practices for video arcade games rapidly became a priority for Atari management.

Cabinet architecture was designed to be inexpensive and easy to manufacture. Bushnell had learned from *Computer Space*'s expensive molded fiber-glass cabinet.[92] Given the high number of orders for *Pong*, cheaper and more uniform models were required. Bushnell and Alcorn put careful thought into potential designs. They initially considered a more uniform fiberglass cabinet, but abandoned the idea after Alcorn toured the facilities of a prospective supplier. He hated the smell of fiberglass, and also worried that production would be too slow to fit Atari's needs.[93] Instead, Atari decided upon a straight, rectangular game cabinet made from wood. It was relatively easy to make, and Atari found a Bay Area supplier that could provide materials in high volume.[94] The

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[88] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[89] Bushnell, as quoted in Kent, p. 52.
[90] Bushnell, as quoted in Kent, p. 53; Goldberg and Vendel, p. 102; Kent, p. 53.
[91] "Atari, Inc. Consolidated Financial Statements: 1974-1975." Al Alcorn Papers, Box 1, Folder 3.
[92] Alcorn, IEEE Global History Network.
[93] Alcorn mentions his dislike for the smell of fiberglass twice in his oral history. He stated at one point "we (he and Bushnell) toyed with some fiberglass ideas, but I went to view the place and I was going Jesus Christ, the smell…" Alcorn, April 26 and May 23, 2008.
[94] Alcorn, IEEE Global History Network.

design, sometimes called the "standard" or "upright" model, became the industry norm throughout the 1970s and early 1980s.

Taking insights from pinball manufacturers, Atari implemented a flexible manufacturing method. Nearly identical structural architecture and hardware was used on each product run. Design standardization allowed for a stockpile of common parts that could be applied to different games as the market fluctuated. Switching between video arcade games on the assembling line was therefore easily achieved by swapping out circuit boards, changing cabinet artwork, and potentially replacing a few electromechanical parts (for example, a joystick with a trackball). If a game proved more or less popular than expected, manufacturing could rapidly alter to fit demand. As Atari explained in its business plan:

> If a game is hot and demand is strong, the manufacturer easily sells out his complete run, all the time working down a large initial order backlog. If the game is lukewarm and sales are below forecast, then the production run can always be decreased, slowed down, or shut off completely to minimize finished goods inventory. Also, due to the high commonality of components, particularly among video games, parts inventories can quickly be committed to the next scheduled new game introductions.[95]

The practice allowed Atari to follow industry trends and reap profits from popular titles. It also protected the company from overproducing unpopular games and damaging its brand.[96] Flexible manufacturing was already common among coin-op amusement companies, and it became common for video arcade games.

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[95] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

[96] To ensure that their machines would draw customers, producers also usually built a limited number of units and tested them on location before moving into a full manufacturing run. Skelly, in Wolf, ed. p. 161.

Innovation

Though the coin-op industry provided models for Atari's business, manufacturing, and game design practices, its practices could not be applied wholesale to video arcade game innovation. By Atari's assessment, the coin-op amusement industry had become old-fashioned and had ceased to innovate. It criticized "old online manufacturers whose technological expertise was limited to basic electromechanics" for being complacent.[97] Developing and engineering truly novel products was not a high priority for industry manufacturers at the time, and there had been few major innovations since the 1950s. Pinball, the technology most closely related to video arcade games, hadn't seen significant innovation since the introduction of the flipper in 1947.[98] Though coin-op amusement companies were devoted to continuous small, surface-level changes to maintain a level of player interest, none were devoted to breaking new technological ground.

Consistent with the initial vision of Atari as an engineering company, Bushnell and Atari management viewed continual innovation as a key to success. In its first few years, Atari made a commitment to "maintain a position of indisputable technological leadership."[99] In 1974 one of its core objectives was to reinvest ten percent of net sales back into the development of new hardware. Where other manufacturers of amusement

[97] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[98] Though it's difficult to pinpoint exactly why coin-op amusement companies didn't prioritize innovation, it is probable that the inability to protect their products from imitators was an important factor. The industry had a long tradition of stealing and/or reverse engineering the products of competitors, partially because very little of the technology was patented or propriety, and partially because the revenue to be gained from releasing a novel coin-op product was greater than the legal ramifications of stealing that product. Allocating a large amount of finances to foster innovation was therefore usually a losing strategy for the innovating company. "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[99] "The Company." Atari, Inc. Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

machines were bringing out five to ten new products a year, Atari claimed to be working on closer to thirty.[100] The continued investment was thought to provide an edge over its competitors. As described by Atari President Joe Keenan,

> The amount of money we spend on developing new technologies… accounts for Atari's prominence in the coin-op games field. We aren't pointing any fingers at anyone else in the industry. But as an example: When Pong was built, 26 other companies started building the same sort of game. For the whole time it was on the market, Atari was busy developing a new type of technology for future games, putting a lot of its earnings from the early games into that. We don't see that in the rest of the games industry. They don't put anything away for future engineering expenses. That is the difference I see – the commitment to the future; looking for things that are barely filling the realm of the electronics market and applying them to coin-operated machines.[101]

By Atari's second generation of video arcade games, many of the high-tech components were proprietary to the company and therefore "difficult to copy and have long lead times from the semiconductor vendors."[102] Games like *Gran Trak 10* (1974), which was promoted as the vanguard of Atari's new line of products, would therefore be "unlikely to have technically equivalent competition in the market for at least 6 months."[103] Though Atari's extensive commitment to innovation was rarely replicated in later years, its practices did encourage other video arcade game companies to develop new inventions and approaches. Even as Atari itself de-prioritized innovation in the 1980s (a topic

[100] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[101] Albarado, October 1975, p. 31-32.
[102] Few semiconductor manufacturers had the capabilities to produce chips in the volume and with the technological sophistication that cutting-edge video arcade games required. Atari reasoned that competitors seeking to copy its products would have difficulty securing the necessary custom chips, and would be unable to do so discretely. "The Company." Atari, Inc. Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1; Kent, p. 95.
[103] "The Company." Atari, Inc. Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

discussed below), video arcade games saw more innovations than other coin-op amusement technologies.[104]

Atari placed particular emphasis on innovating hardware and software components that could be applied to multiple games. As 1974-1975 business plan explained, "The major thrust of Engineering is to develop functional building blocks, around specific technology, and rearrange, modify, and re-program these blocks to product a family of games with significant underlying modularity."[105] Uniformity and internal design similarity were desirable because they cut down on manufacturing expenses. "Cost effectiveness rather than technical elegance" was the ultimate goal.[106] Interchangeability allowed for multiple product runs based upon a single innovation or set of innovations. The approach is evident in several iterations of *Pong* and in various car racing and combat games released in the mid-1970s. A focus on modular innovations helped Atari to sell different products with similar hardware and software designs. The strategy maintained a level of novelty (albeit often superficial), generated profits for Atari, and became common to video arcade game producers.[107]

Atari's innovation practices came with unique challenges. Due to the prevalence of reverse engineering and imitation in the coin-op amusement industry, secrecy was a major concern. The company took "extensive precautions" to protect its hardware designs

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[104] A possible exception was pinball machines produced between 1976 and 1978. Using video arcade games as a model, coin-op amusement companies incorporated solid state electronics into the design of pinball machines. For a brief period pinball enjoyed a remarkable pace of technological innovation. However, this pace slowed from 1979 onward, possibly because coin-op amusement companies devoted their attention to the booming market for video arcade games.
[105] "Products and Technology." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[106] "Products and Technology." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[107] Kent, p. 118, 129-132, 137-139,143.

and engineering processes.[108] It employed in-house security measures involving key cards, combination locks, and an "ultra-sonic alarm system" at night.[109] The attention and expenses were justified by Atari's experiences following the release of *Pong*. The company lost major profits to imitators following the game's release, and its high-tech innovation model was deeply threatened by companies that could produce similar games while not having to incur the costs and risks of innovation. Despite its precautions, copying Atari hardware and software remained common throughout the mid-1970s. For example, Fun Games, Inc. released *Tankers* (1975), a blatant copy of Atari's *Tank* (1974), and *Biplane* (1976), a slightly modified version of Atari's *Jet Fighter* (1975). When Atari examined the internal architecture of both games, it found copies of motion circuits that it considered "one of Atari's trade secrets."[110] Such events were not uncommon in the first several years of video games.[111]

In 1974 Atari management experimented with focusing a large amount of resources on a single machine. It decided upon a formula-one racing simulation named *Gran Trak 10.* Atari described it as a "very complex" game and several proud mentions in the company's FY 1975 business plan indicate that a lot was riding on its success.[112] Pre-release coverage in *Electronic Engineering Times* stated "With well over a half-million dollars invested in R&D, *Gran Trak 10* is without contest the most expensive and

[108] "Atari, Inc. v. Mar-Quin Company, Inc.: Declaration of Steven Bristow, 10/7/75." Steve Bristow Papers, Box 3, Folder 2.
[109] "Atari, Inc. v. Mar-Quin Company, Inc.: Declaration of Steven Bristow, 10/7/75." Steve Bristow Papers, Box 3, Folder 2.
[110] "Atari, Inc. v. Mar-Quin Company, Inc.: Declaration of Steven Bristow, 10/7/75." Steve Bristow Papers, Box 3, Folder 2.
[111] Kent, p. 57-64.
[112] "The Company." Atari, Inc. Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1; "Letter: Critique of Preliminary Gran Trak 10 Production Run, 3/26/1974." Al Alcorn Papers, Box 1, Folder 6.

sophisticated pinball plunker's dream ever conceived."[113] Atari promoted the game with fanfare, "Video games enter the second generation with GT10 – the first computer game that simulates all the dynamics of Gran Prix racing… a steering wheel, 4-speed gear shift, accelerator pedal and brake all work to control the video generated car. Electronically-created sound effects build excitement and realism."[114] *Gran Trak 10* was well-received by both users and mainstream media. *Time* magazine glowingly reported that "the view from the cock-pit of a Grand Prix car negotiating the hairpin curves of the track at Le Mans… is so realistic, Atari executives report, that "we've watched guys leaving the wheel with sweat pouring down their faces."[115]

Unfortunately for Atari, the amount of time and money invested into *Gran Trak 10* did not lead to profits. An internal technical critique just before its release pointed out eighteen problems with the circuit board design, fifteen manufacturing issues, and recommended five changes to the set-up parameters.[116] The original cabinets had overheating problems and required the installation of ventilation after shipment.[117] Its electromechanical components, especially a gas pedal that controlled in-game speed, were too fragile and prone to malfunction when subjected to hard use. *Gran Trak 10*'s technical flaws led to both increased costs and disgruntled coin-op industry personnel. Though the game sold well and was popular with users, it was a financial failure for

[113] "Only in the U.S.: Space Age Pinball for Fun and Games." *Electronic Engineering Times*, March 25, 1974. Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[114] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[115] "Space-Age Pinball." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[116] "Letter: Critique of Preliminary *Gran Trak 10* Production Run, 3/26/1974." Al Alcorn Papers, Box 1, Folder 6.
[117] It's unclear what this entailed, but "installation of ventilation" may well have been code for drilling a series of holes in the back of the cabinet. "Primary Requirements and Commitments to the various countries." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

Atari. Its technological sophistication meant it was expensive to develop and implement, and an accounting error famously led the machines to retail for less than they cost to manufacture and distribute.[118] Atari took a major loss and in the future was cautious about sinking so much money and time into developing a single product.[119] With a few exceptions other video game companies followed its lead.

Part Five - The Video Game Industry

In 1974 there were at least fifteen companies that manufactured coin-op amusement machines and thirteen had produced a video game.[120] By the Music Operators of America trade show the following year, twenty-three companies exhibited video arcade games.[121] Major coin-op amusement companies such as Allied Leisure, Bally (through its Midway subsidiary), Chicago Coin, and Williams were manufacturing video arcade games by 1975.[122] By 1981, nearly all coin-op device manufacturers made video arcade games.[123] Each competed for the same business as Atari. Bally was the largest,

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[118] This is stated by Scott Cohen and repeated by Steven Kent. Scott Cohen. *Zap! The Rise and Fall of Atari* (New York: McGraw-Hill, 1984), p. 92; Kent, p. 68.

[119] *E.T.* (1982), designed for the Atari Video Computer System (VCS) home console, was a notable and disastrous exception. However, this was due to licensing, marketing, and manufacturing mistakes rather than over-investment in innovation and development. Kent, p. 237-239.

[120] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

[121] Ralph Lally, ed. "Innovations characterize exhibits at largest MOA ever," *Play Meter*, Vol. 1, No. 10, October 1975, p. 18.

[122] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.

[123] These included long-time coin-op industry giants such as Stern, Gottlieb, and Rock-Ola (though later only through licensing arrangements with Cinematronics and Namco). As described by *Play Meter*: "The year (1981) has shown the incursion of games manufacturers over into the video market not to be a flash in the pan. Those producers include not only the pinball makers who tested the market, with noted success, last year – but also old-line manufacturers formerly devoted to jukeboxes, pool tables, or gaming equipment. While success has been spectacular for some and limited for others, it is clear that few domestic factories can any longer maintain one-horse stables, but most will ride videos down their paths to the coin-op market." Ralph Lally, ed. "'The year the industry found itself:' Reviewing the coin-op year 1981," *Play Meter*, Vol. 7, No. 23, December 1981, p. 22.

though about sixty percent of its estimated $120 million annual business came from slot machines rather than video games. Sega was the largest non-U.S. company with an annual sales figure of $22 million.[124] Atari manufactured between 80 and 100 units per day but claimed that the largest manufacturers (probably referring to Bally) could produce up to 150 units per day.[125]

As the video game industry expanded, Atari found itself in need of funds. By 1976 the revenue of Atari's coin-op division was slumping (partially due to a downturn in the market and partially due to increased competition) and manufacturing costs loomed with the pending release of the Atari VCS home console. The board of directors met to discuss options. It decided not to seek venture capital, and going public was rejected due to the poor state of the stock market.[126] Selling to a larger corporation seemed to be the only way to generate sufficient funds. However, when Bushnell approached potential buyers he found few takers. He recalled, "Everybody was losing interest in the digital watch and the pocket calculator, and most of the people we went to wondered why video games would be any different."[127]

Eventually, Warner Communications bought Atari for $28 million in October of 1976. The company justified the purchase price owing to Atari's potential to make video games a common home entertainment product. The deal had some immediate benefits for

[124] It's notable that there were few thematic or technical differences between Japanese and American video arcade games at the time and companies from both regions competed in the same genres and for the same revenue. Ralph Lally, ed. "Japanese show – much the same," *Play Meter*, Vol. 3, No. 23, December 1977, p. 17.
[125] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[126] It is unclear why Atari did not seek venture capital in 1976. The company had no compunction against venture capital (having sought and received it in 1975), and prominent venture capitalist Don Valentine sat on the Atari board of directors. Kent hints that Bushnell may have feared that Atari would have to agree to "special arrangements" in order to secure funds, and therefore pursued other means. See Kent, p. 102-103.
[127] Bushnell, as quoted in Kent, p. 103.

Atari. *Television Digest* wrote that the "acquisition of coin-op & home video game supplier Atari by Warner Communications not only lends the game field a needed touch of respectability, but gives Atari a strong edge in the programmable, cartridge-based market."[128] Warner immediately sunk $100 million into Atari, ending its capital problems. Bushnell was quoted as saying "Now I can stop running around the country trying to raise money and get back to running the company. We needed someone with full pockets, and we got it. This gives us the money to do a lot of things we couldn't do."[129] Atari gained access to a home electronics distribution network separate from its coin-op industry channels, which was a matter of key importance with the coming release of the VCS home console. When initial sales of the VCS were slow due to a crash of the video game market in 1977 (discussed in chapter one), Warner was able to sustain Atari until conditions improved.[130]

The era from 1977 to 1983 marked a time when video arcade games became big business.[131] Especially during the Golden Age (1979-1983) video games reached a wide audience, were a major aspect of American culture, and generated large profits.[132] Japanese companies such as Taito, Namco, and Nintendo came to rival Atari as thematic and technological innovators. Bally entered into licensing agreements to manufacturing

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[128] *Television Digest*, Vol. 16, No. 37, p. 11. Steve Bristow Papers, Box 3, Folder 1.
[129] By "raise money," Bushnell was probably referring to his efforts to sell Atari. See *Television Digest*, Vol. 16, No. 37, p. 11. Steve Bristow Papers, Box 3, Folder 1.
[130] Chapter one, "Bust - 1976-1978."
[131] Though Atari was doing millions of dollars in sales in the early 1970s, the size and scope of their operation paled in comparison to what came after.
[132] This is perhaps best exemplified by an article in *Time* published in January of 1982. As summarized by Steven Kent, "A *Time* magazine cover story reported that Americans dropped 20 billion quarters into video games in 1981 and that "video game addicts" spent 75,000 man-years playing the machines. The article went on to explain that the videogame industry earned twice as much money as all Nevada casinos combined, nearly twice as much money as the movie industry, and three times as much money as major league baseball, basketball, and football." I was unable to corroborate these claims, but the article nonetheless is suggestive of the size and impact of the video arcade game business. Kent, p. 152.

several Japanese-designed video arcade games in the United States and turned them into domestic hits. Successful games such as *Space Invaders* (1978) and *Pac-Man* (1980) expanded Bally's business, and by 1980 its video arcade game operations were roughly equal to those of Atari.[133] As competition increased, Atari and its peers flooded the market with similar products, frequently undercutting each other and diluting overall quality. Producers cut corners as they struggled to capture the attention of core demographics and secure a share of industry profits, all the while facing the mounting public scrutiny that came with increased popularity.

Imitation as Common Practice

The video arcade game industry began with a case of copyright infringement. Alcorn's *Pong* was based upon a game concept articulated to him by Bushnell, but the idea was not new. Ralph Baer, often described as the "father of video games," had previously created a video tennis game for the Magnavox Odyssey home console. Bushnell, as a member of Nutting Associates, played Baer's game at a trade show in May 1972.[134] Bushnell was unimpressed, and only passed the idea on to Alcorn as a training exercise because he thought it would be simple to implement.[135] After *Pong* was released in November, 1972, Magnavox brought a lawsuit against Atari. Faced with high legal fees, Atari eventually settled in June 1976. Magnavox received a one-time, $1.5 million

[133] Though I was unable to find exact numbers, the roughly equal status of Atari and Bally is indicated by coin-op industry trade publications. It should also be noted that by 1980 a significant portion of Atari's business stemmed from home video arcade games, and that Bally had diversified business operations outside of video games. Ralph Lally, ed. "Play Meter Survey Results: Videos sweep to big gains in 1980," *Play Meter*, Vol. 6, No. 21, November 1980, p. 26.
[134] Bushnell, as quoted in Ramsay, p. 27.
[135] Bushnell, as quoted n Ramsay, p. 28; Goldberg and Vendel, p. 68.

licensing fee from Atari, the rights to any Atari products released for the next year, and the rights to the royalties from other tennis-style video games.[136] At the time it probably seemed a fair deal to both sides, but in hindsight (and in the recollections of Alcorn, Baer, and Bushnell) it was a coup for Atari. The licensing fee paid to Magnavox proved to be a pittance compared to what *Pong* earned. Atari avoided giving the rights to future products by delaying the release of home electronics and focusing on coin-op products that Magnavox had little interest in.[137]

Imitation was common practice in the video arcade game industry. Atari commonly produced multiple games based upon similar themes, gameplay mechanics, and underlying technologies. *Pong* gave rise to other Atari games such *Doctor Pong* (1973) and *Puppy Pong* (1974) (fig. 2-3).[138] *Gran Trak 10* was used by Atari to create *Indy 800* (1975) and *LeMans* (1976) (fig. 2-4).[139] When other companies began producing innovative video arcade games, Atari imitated their designs and ideas. In the notes of a 1980 brainstorming meeting, one Atari developer proposed that they "copy *Galaxian*" (1979), a game developed by Namco and licensed to Bally through its Midway

[136] Al Alcorn remembered the figure to be $700,000. The same number was initially repeated by the New York Times, but later changed to $1.5 million in a correction. Alcorn, as quoted in Kent, p. 47; Douglas Martin. "Ralph H. Baer, Inventor of First System for Home Video Games, Is Dead at 92," *The New York Times*, December 7, 2014. http://www.nytimes.com/2014/12/08/business/ralph-h-baer-dies-inventor-of-odyssey-first-system-for-home-video-games.html?_r=0 (accessed 8/4/15)
[137] Bushnell, as quoted in Kent, p. 48.
[138] Goldberg and Vendel, p. 110.
[139] "Atari: the First Decade, 1972-1982. The 8th Annual Atari Distributors Meeting." Steve Bristow Papers, Box 12, Folder 15; Goldberg and Vendel, p. 137.

Figure 2 - 3: Advertisement for *Dr. Pong* (left) and *Puppy Pong* (right). "*Puppy Pong/Dr. Pong*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=1986&image=1 (accessed 5/19/15)

subsidiary.[140] Another proposed the same with Williams' *Defender* (1980).[141] Bristow described an idea called "Cliff Hangers" as "upside down space invaders."[142] Such approaches were common among producers. In 1980, game production was dominated by variations of Taito's *Space Invaders* (1978) and Atari's *Asteroids* (1979). In 1981, these had been replaced by imitations of Namco's *Pac Man* (1980) and Williams' *Defender*, that latter of which was developed as a hybrid of *Space Invaders* and *Asteroids*.[143]

[140] "Engineering Notebook." Steve Bristow Papers, Box 1, Folder 6, p. 69.
[141] "Engineering Notebook." Steve Bristow Papers, Box 1, Folder 6, p. 80.
[142] "Engineering Notebook." Steve Bristow Papers, Box 1, Folder 6, p. 85.
[143] "Inter Office Memo: 1981 AMOA Trip Report." Steve Bristow Papers, Box 14, Folder 7; Kent, p. 145.

Figure 2 - 4: *LeMans* (left) and *Gran Trak 10* (right). The International Arcade Museum. http://www.arcade-museum.com/images/130/1300773788.jpg; http://www.arcade-museum.com/images/120/1208732969.jpg (accessed 5/19/15)

Innovation still took place and, at least until 1982, continued at a steady pace, but successful unique designs were typically followed by a series of knockoff products with minor changes.

Widespread imitation was made possible by ambiguities in the law. Developing effective legal practices was difficult for producers because existing copyright protections had no clear place for video arcade games. There was confusion in the courts over whether they were "audiovisual works" or "literary works." The distinction was

important in determining what protections, if any, could be applied and whether a company had actually copyrighted a given aspect of a game.[144] Typically video game companies opted for "audiovisual works" copyright and registered videotapes of gameplay and attract screens. This protected the visual aspects of a game but not its software program, which was covered under "literary works." Under this model there was little recourse for the blatant copying of game features and mechanics embedded the code.[145] "Standardized video game elements" could not be copyrighted because they were "scène à faire," a legal term referring to customary aspects and themes of a given genre of work. The maze design of *Pac-Man*, for example, could not be protected because it was a defining element of the maze-chase genre.[146]

Copyright protections were further complicated because courts varied widely in their characterizations and descriptions of video arcade games. A dispute over *Scramble* (1981), a side scrolling aircraft game engineered by Japanese video game developer Konami and manufactured in the U.S. by Stern, serves as an example. In the initial trial, the judge described *Scramble* as "[i]n essence …a movie in which the viewer participates in the action as the fearless pilot controlling the spaceship."[147] However, upon appeal a second court wrote that video arcade games may "roughly be described as a computer programmed to create on a television screen cartoons in which some of the action is controlled by the player."[148] The difference was significant because movies, as described

[144] Morton David Goldberg. *Software Protection and Marketing: Computer Programs and Data Bases; Video Games and Motion Pictures, Vol. 1* (New York: Practicing Law Institute, 1983), p. 228.
[145] Goldberg and Vendel, p. 232-233.
[146] Goldberg and Vendel p. 236-237.
[147] Goldberg and Vendel, p. 227.
[148] Goldberg and Vendel, p. 227.

by the first judge, operated under different copyright criteria than computer programs, as described by the appeals court. The ambiguity discouraged expensive legal actions because it was difficult to predict the outcome.

Even when courts decided in favor of the innovating company, copyright lawsuits could set uncomfortable precedents. After Atari successfully sued Magnavox over *K.C. Munchkin* (1981), a *Pac-Man* clone designed for the Odyssey home console, the federal appeals court wrote that there were fundamental differences between video games and other copyrightable media: "Video games, unlike an artist's painting or even other audio-visual works, appeal to an audience that is fairly undiscriminating insofar as their concern about more subtle differences in artistic expression."[149] The nuances of video game artistry paled in comparison to "stimulation provided by the intensity of the competition" that was the "main attraction" of a game.[150] Therefore "a person who is entranced by the play of the game 'would be disposed to overlook' many of the minor differences in detail and 'regard their aesthetic appeal as the same.'"[151] Such rulings established legal criterion that delegitimized the medium and established precedents that could be an impediment to future cases.

As video arcade games grew in popularity between 1979 and 1983 most producers rushed to imitate without reservation. Such practices were financially advantageous during the height of video arcade game popularity, when high operator and

[149] Goldberg and Vendel, p. 580; "News Release: Atari/Pac-Man win in Chicago Federal Court of Appeals." Steve Bristow Papers, Box 12, Folder 15.
[150] "News Release: Atari/Pac-Man wins in Chicago Federal Court of Appeals." Steve Bristow Papers, Box 12, Folder 15.
[151] "News Release: Atari/Pac-Man wins in Chicago Federal Court of Appeals." Steve Bristow Papers, Box 12, Folder 15.

distributor revenues enabled the purchase of multiple similar machines. However, increased market saturation and decreased overall quality eventually led to the disastrous 1983 crash.[152]

Who Video Games Were For

Atari was inconsistent about the intended audience of video arcade games. On the one hand, a desire to reach a large user base and a degree of utopianist, technological egalitarianism amongst Silicon Valley engineers encouraged assertions and assumptions that video arcade games had no demographic constraints. On the other hand, Atari made a variety of design and business decisions that, intentionally or unintentionally, aimed the machines at particular groups.

Especially early on, Atari created video arcade games specifically with adults in mind. Its early to mid-1970s "innovative leisure" slogan was designed to appeal to affluent adults rather than youths or children.[153] Some Atari games were explicitly intended for bars, and beginning in 1975 many of its products came in "cocktail" variants, or horizontally oriented cabinets that doubled as surfaces for alcoholic drinks (fig. 2-5).[154] Its business plan stated:

> In 1975 the product line will feature a packaging approach aimed at penetrating more sophisticated locations, locations previously not available to coin-operated machines due to

[152] Ralph Lally, ed. "Operators Sound off About the Manufacturers, Distributors," *Play Meter*, Vol. 10, No. 20, November 1984, p. 50-51.
[153] "Summary of Employee Stock Ownership Plan." Al Alcorn Papers, Box 1, Folder 3.
[154] "Atari New Product Forecast." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1. See also Beley and Albarado, April 1975, p. 27.

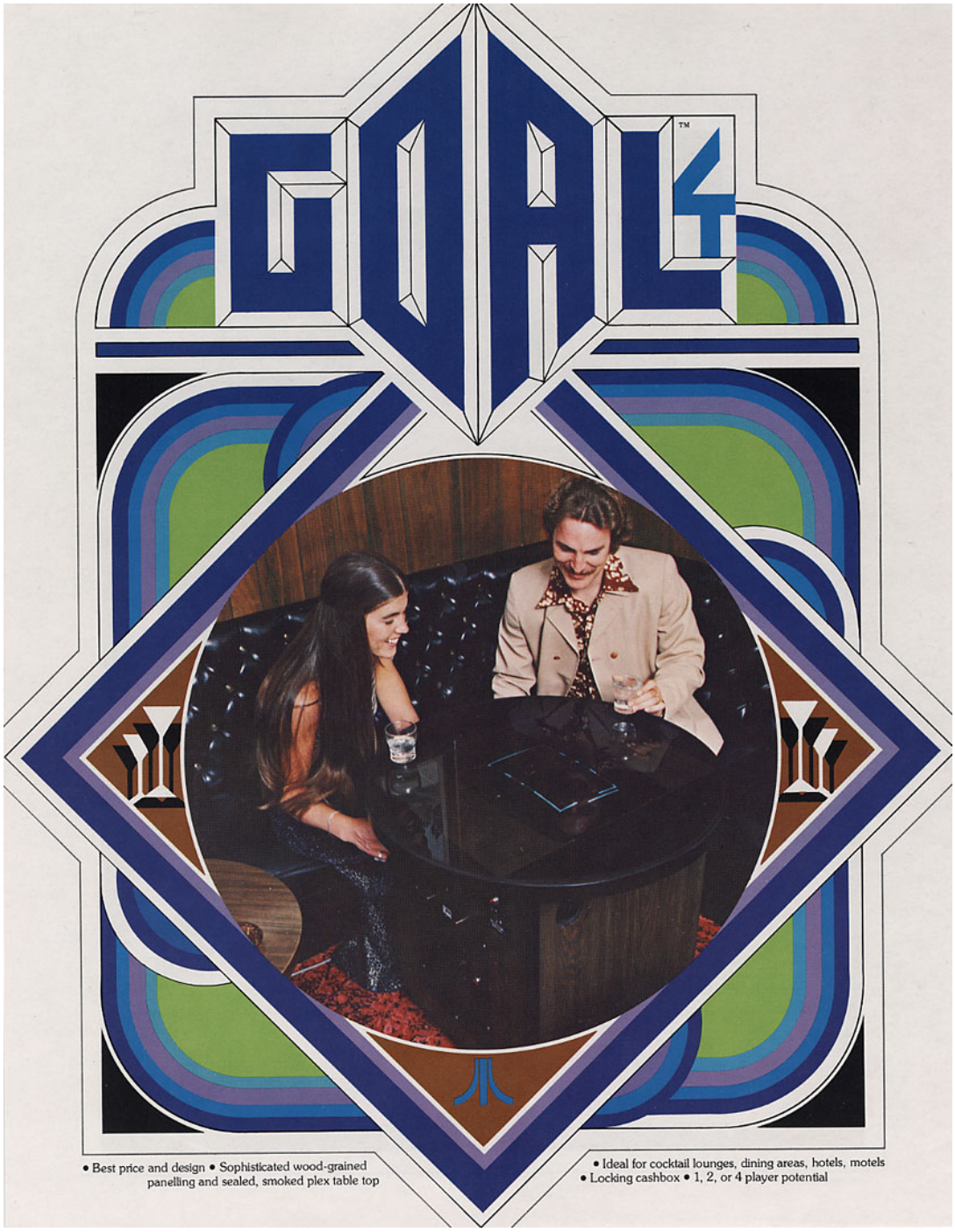

Figure 2 - 5: A flyer for *Goal 4* (1975) featuring two adults resting drinks on the cocktail cabinet top. It claims that the "sophisticated wood-grained paneling and seated, smoked plex table top" makes the game "ideal for cocktail lounges, dining areas, hotels, motels." "*Goal 4*." The Arcade Flyer Archive. International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=2507&image=1 (accessed 5/19/15)

> styling limitations. Furniture styling compatible with cocktail lounges, aircraft lounges, and clubs will be stressed, and the combination of advanced electronics and styling will produce incremental sales opportunities.[155]

Appealing to an older demographic than the typical coin-op amusement audience was consistent with Bushnell and Dabney's original philosophy. As Bushnell wrote while still working for Nutting Associates, "It was our object in *Computer Space* to design an amusement machine which would appeal to adults as well as children. From collection reports around the country we have exceeded our expectations."[156]

The video arcade game industry evolved over time to cater to a young demographic, as reflected by presentation styles (both in games themselves and in cabinet artwork) and common themes.[157] Why this happened is unclear. Producers may have increasingly developed games to appeal to a seemingly obvious core demographic of young players, or it may be that user patterns were unintentionally established by producer choices regarding subject matter, design, and gameplay mechanics. Regardless of the cause, by the early 1980s (if not earlier) most video arcade game users were teenagers.[158] For its part, Atari was inconsistent about whether or not video arcade games were intended for younger users. In a 1977 issue of *Atari Coin Connection*, a company newsletter intended for operators and distributors, it stated "Youth, 16 to 20, is our

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[155] "Products and Technology." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[156] "Computer Space Service Manual, 1972." Steve Bristow Papers, Box 6, Folder 5.
[157] Ralph Lally, ed. "The Industry Must Recapture Players' Interest," *Play Meter*, Vol. 9, No. 20, November 1983, p. 6.
[158] See, for example "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1; George Gallup. "Video game graze sweeps teenage America," *Play Meter*, Vol. 8, No. 22, November 1982, p. 100; Jaffe, p.1; Bill Kurtz. "Tonight's arcade special: All you Can Play," *Play Meter*, Vol. 9, No. 10, June 1983, p. 56; Loftus and Loftus, p. 3.

primary target market."[159] By 1979 the target market was even younger, and the newsletter emphasized the potential mediator revenue represented by "approximately 30,000,000 teenagers in the U.S" spending "about $45 billion per year."[160] However, Atari maintained a desire to appeal to older users. For example, in 1980 its coin-op division noted that the "U.S. is getting older" and that it would be wise to develop games that catered to adults and adult locations.[161] In 1981 Atari felt the need to include blurbs in its software products catalog that the personal computer game versions of some of its arcade titles were intended for all audiences. *Asteroids* was "not just for kids," and *Missile Command* (1980) was "a game for kids of all ages."[162]

Video arcade games had strong masculine connotations. Producers tended to generate games with masculine themes, presented them in masculine ways, and judged them based upon male-centric criteria. Combat, sports, and science fiction games all had masculine connotations. Most of Atari's early products were age neutral but not gender neutral. Games like *Tank*, *Jet Fighter* or *Outlaw* (1976) were not discriminatory, but the scenarios they depicted were male gender. Sexualizations of the female body were an accepted part of both game design and advertising. In 1981 Bristow called Nichibutsu's *Frisky Tom*, which rewards successful players with a scene of a naked woman taking a bath, "a cute game."[163] Flyers for Atari's *Gotcha* (1973) pictured a woman in a negligee running from a man who is reaching to grab her by the waist (fig. 2-6). The game's

[159] Carol Kantor, ed. "Location Profile: the Campus," *Atari Coin Connection*, Vol. 1, No. 10, September 1977.
[160] Carol Kantor, ed. "U.S. Teen Market," *Atari Coin Connection*, Vol. 3, No. 4, April 1979.
[161] "Engineering Notebook." Steve Bristow Papers, Box 1, Folder 6, p. 59.
[162] It's worth noting that not all games included such caveats. "Atari: 1981 Software Catalog." Steve Bristow Papers, Box 13, Folder 7.
[163] "Engineering Notebook." Steve Bristow Papers, Box 15, Folder 1.

Figure 2 - 6: *"Gotcha."* The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=461&image=1 (accessed 5/19/15)

control pads were deliberately designed to "look like boobs."[164] An advertisement for Stern's *Moon War* (1981) featured a woman in a half-tee and hiked-up short shorts, butt thrust towards the camera without context or relevancy to the actual game (fig. 2-7).[165]

The gendering of video arcade games stemmed in part from common perceptions of other coin-op amusement technologies. Probably due to connotations to criminality and seedy areas presumed unsafe for most women, pinball machines were often overtly masculine. Advertisements and backplates for pinball had a higher tendency than their video arcade game counterparts to display highly sexualized images of women.[166] The subject of Gottlieb's *Slick Chick* (1963) was a gentleman's club, and pictured women in revealing "bunny" costumes. Pinball machines such as Bally's *Wizard* (1974) and *Playboy* (1978) included sexualized drawings of women (fig. 2-8).[167] Other pinball machines were more subtly gendered. Men were illustrated in the lead roles, with women placed in supporting roles or as "damsels in distress." For example, Bally's *Paragon* (1979) featured a shirtless, heavily-muscled man battling a chimera threatening a prone, chained woman wearing a bikini (fig. 2-9).[168] Most coin-op amusement companies produced both pinball machines and video arcade games. The technologies frequently occupied the same spaces. Particularly after dedicated arcades became common in the industry, the same establishments that held *Centipede* (1981) or *Pac Man* might carry

[164] Regan Cheng, as quoted in Goldberg and Vendel, p. 151.
[165] "*Moon War*." Steve Bristow Papers, Box 14, Folder 7.
[166] See various flyers in the Steve Bristow Papers, Box 14, Folder 7; Steve Bristow Papers, Box 15, Folder 1.
[167] "Bally Pinball 1979-1 Parts Catalog Electronic Pinball Games." Steve Bristow Papers, Box 8, Folder 4, p. 20.
[168] "Bally Pinball 1979-1 Parts Catalog Electronic Pinball Games." Steve Bristow Papers, Box 8, Folder 4, p. 36.

Figure 2 - 7: "*Moon War*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=696&image=1 (accessed 5/19/15)

Figure 2 - 8: Section of a *Playboy* flyer. The Arcade Flyer Archive. International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=pinballdb&id=810&image=3 (accessed 5/19/15)

pinball machines displaying scantily-clad or even naked women.[169] It's likely this contributed to understandings of both arcades and video arcade games as existing for males.

Video arcade games also became masculine because a masculine culture pervaded video game companies. Atari was an acute example. New products in development were codenamed for "sexy female employees."[170] Management had a reputation for

[169] See, for example, *Viper* (1981) and *Catacomb* (1981), among numerous others. Steve Bristow Papers, Box 14, Folder 7.
[170] Kent, p. 56.

Figure 2 - 9: *"Paragon."* The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=pinballdb&id=809&image=1 (accessed 5/19/15)

womanizing. Alcorn's recollection of a board meeting that Bushnell held in the hot tub of his Los Gatos home is telling: "Nolan needed some papers and documents so he called his office and said, 'Have Miss so and so bring them up.' We were in this tub [when she arrived], so he proceeded to try to get her in the tub during the board meeting… That was the sort of fun we had."[171] Carol Shaw, Atari's first female developer, remembers Warner executive Ray Kassar welcoming her to the company by joking "Gee, now that Atari has a female game designer, she can do interior decorating and cosmetic color-matching games!"[172] When the coin-op division filmed a series of skits, Dona Bailey, the only female developer in the business unit, was cast to play a prostitute.[173] She later recalled, "I think that there was a lot of additional pressure just by being the only female. I think I was watched a lot more than I would've been."[174] There were similar conditions in other companies. Bored with the background star field in *Star Castle* (1980), programmers for Cinematronics brought a "pile of porn magazines" back to the office and modelled a constellation after one of the centerfolds.[175] Such practices and events likely made the industry an uncomfortable place for women. Most video arcade games were therefore

[171] Alcorn, as quoted in Kent, p. 57.
[172] Kassar later ascended to become CEO of Atari and, in his opening address to the company, made similar remarks regarding Atari home computers. As described in Goldberg and Vendel, "Ray starts talking about how Atari would sell the computers in designer colors so that women would buy them. He then said they would also have home decorating software… The women in the room, most from the San Francisco/Berkeley area – the bastion of women's lib, saw it as completely sexist. Carol Shaw, the first female programmer at Atari, threatened to quit over the whole speech." Goldberg and Vendel, p. 383-384. See also Carol Shaw, as quoted in Tracey Lien. "No Girls Allowed," *Polygon*, December 2, 2013. http://www.polygon.com/features/2013/12/2/5143856/no-girls-allowed (accessed 4/1/15).
[173] Kent, p. 134.
[174] Dona Bailey, as quoted in Leigh Alexander. "The Original Gaming Bug: *Centipede* Creator Dona Bailey," *Gamasutra*, August 27, 2007. http://www.gamasutra.com/view/feature/130082/the_original_gaming_bug_centipede_.php (accessed 4/1/15).
[175] Skelly, in Wolf, ed. p. 156.

designed, authorized, and implemented by men, and reflected the viewpoints, experiences, and identities of their creators.

There were some attempts to makes games that catered to women. *Pac-Man*, for example, was designed with female players in mind. According to developer Toru Iwatani "At that time, as you will recall, there were many games associated with killing creatures from outer space. I was interested in developing a game for the female game enthusiastic."[176] He designed the game to be non-violent and created "cute" ghosts as opponents in the hopes of attracting a female user base. *Pac-Man* was later coopted by a group of male hackers at MIT and repurposed as *Ms. Pac-Man* (1981). It was eventually released (following a round of legal issues and negotiations) by Bally/Midway. The cabinet featured a female version of Pac-Man with make-up, long and slim legs, and high heels lounging in a sexualized pose and being watched (or perhaps leered at) by a grinning pink ghost (fig. 2-10). Its service manual stated "When playing this game, you are in complete control of Ms. Pac-Man. She will go where you tell her to… [The ghosts] never give up in their pursuit of her."[177] No such sexualized language was included in the *Pac-Man* service manual.[178] Nonetheless, both *Pac-Man* and *Ms. Pac-Man* purportedly "appealed in earnest to the ladies."[179]

[176] Iwatani Toru, as quoted in Kent, p. 141.
[177] "Ms. Pac-Man Parts and Operating Manual, 1982."The International Arcade Museum. http://www.arcade-museum.com/manuals-videogames/M/ms_pacman_p1.pdf (accessed 11/26/14)
[178] "Pac-Man Parts and Operating Manual, 1980." The International Arcade Museum. http://www.arcade-museum.com/manuals-videogames/P/pac-man_p1.pdf (accessed 11/26/14)
[179] Kent, p. 172; Ralph Lally, ed. "Coinman Interview: Alan Saffron," *Play Meter*, Vol. 9, No. 10, June 1983, p. 55.

Figure 2 - 10: *Ms. Pac-Man* cabinet artwork. The International Arcade Museum. http://www.arcade-museum.com/images/118/1181242138312.jpg (accessed 5/19/15)

The video arcade game most successful at attracting female players was Atari's *Centipede*. The game centered on shooting bugs in a garden and was "one of the few games that appealed to female players as well as male."[180] Not coincidentally, it was co-designed by Dona Bailey and Ed Logg. There was nothing particularly feminine about its theme, which was described as a "bug shooter," or its mechanics, both of which were primarily designed by Logg.[181] It was not intended to be a feminine game.[182] Perhaps it was popular with women because its pastel color scheme, designed by Bailey, had some intrinsic appeal, or perhaps Atari's marketing department did an exceptional job of "promoting Centipede as the first coin-op video game programmed by a female."[183] Whatever the case, it was a major hit for Atari and became famous for appealing to

[180] The assumption that *Centipede* catered to female users was strong enough that several people informed me that it was intended for girls at the 2013 California Extreme Classic Arcade Game Expo. See also Goldberg and Vendel, p. 517; Kent, p. 160.
[181] Goldberg and Vendel, p. 517; Kent, p. 161.
[182] Lyle Rains, an executive in Atari's coin-op division, stated "[Atari] didn't do anything in particular to achieve [*Centipede*'s appeal to women]. The major portion of the marketplace is male, so we're not looking to do anything that would alienate them. I can't start putting an emphasis on just attracting a female population. We will, however, try to maintain a graphics level that doesn't offend female tastes, if possible." Lyle Rains, as quoted in Steve Bloom. *Video Invaders* (New York: Arco Publishing, Inc., 1982), p. 143-144.
[183] Goldberg and Vendel, p. 517.

female users. It was also Bailey's first and only game. She left Atari in 1982, only two years after joining the company. She recalled that following the success of *Centipede* "the typical kind of thing that people would say was, either it was a fluke or I didn't really do it, somebody else did it. I'm a very peaceful person, and I felt sick of fighting, so I just disappeared."[184]

Video Games under Fire

As Atari competed against the rest of the video arcade game industry, it also attempted to combat the "moral panic" surrounding video games.[185] The company kept Dr. Mitchell Robin, a child psychologist, on the payroll to advocate for the benefits of video games. In a 1982 op-ed piece to the *New York Times*, Robin argued "Children who aren't athletically included can use video games as a means to success that is accepted by their peers. That type of acceptance through a particular skill is very important to the psychological health of adolescents."[186] He played up the educational value of video games: "Normally inquisitive children who play video games ultimately ask, 'How does the game work?' and even more important, 'How can I make it work?' and that, of course, is what education is all about."[187] Robin worked to dismiss public morality concerns as an irrational fear of the unknown. He stated that

> [Anti-video arcade game campaigns] are created out of fear of the unknown, in this case computers. Adults are afraid of the power of computers. This is understandable because we

[184] Bailey, as quoted in Alexander, August 27, 2007.
[185] Chapter one, "Moral Panic."
[186] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.
[187] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.

> didn't grow up with them. But we mustn't forget that our society is becoming more and more computerized, and by the time our children are our age they will be using computers in all aspects of their lives.[188]

Robin's solution to moral concerns over the seediness of some arcades was to encourage people buy home consoles. He wrote "Once the initial expense is incurred the game can be enjoyed by the whole family for many years. This type of entertainment can bring the family together again, and not just to sit in front of the TV set but to interact with it and with each other through competition."[189] The advice may have been bad for the video arcade game business but was good for sales of the Atari VCS, which dominated the burgeoning home console market.

Atari echoed Robin's arguments in a video entitled "Video Games: a Public Perspective." It was made in the style of a public service announcement and disseminated to placate public fears over the corrupting influence of video arcade games. Its argument becomes clear in the first thirty seconds. Two elderly people (one female, one male) briefly state their concerns over the use of video arcade games. They are juxtaposed with an adolescent girl talking in favor of video arcade games. An older man is shown laughing and smoking a cigar. An adolescent boy is shown playing a video arcade game and chewing gum. The video goes on to feature interviews with Atari employees putting a positive spin on the game development process. Users, primarily teenagers but also adults, appear to speak about the feelings of empowerment, fun, community, and reward for hard work induced by video arcade game play. Charles DiGiacomo, a public official

[188] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.
[189] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.

of Westchester County, New York, appeared on film to combat anti-video game ordinances.

> To me it makes absolutely no sense at all because I know that there are very young people that use these games and middle aged people and older people that use [them]. And I think that young people should be allowed to use them because it helps them with their reflexes and eye-coordination. I think it's a valuable tool for all of us.[190]

Professors at M.I.T., the University of Connecticut at Stamford, and the University of Illinois at Urbana-Campaign gave testimony about the educational value of video games. The video argued that video arcade games kept kids "off the street" and out of gangs. Potential issues were framed as a problem of unsupervised youth, and the video placed the responsibility on parents and arcade owners to ensure that use was a positive activity.

Despite these efforts by Atari, producers as a group were more interested in selling video arcade games than convincing concerned non-users of their virtue.[191] Though violence was almost never utilized as a selling point for video arcade games, it was tacitly employed by game developer Exidy. After a handsome sales increase followed public outcry over *Death Race* (1976), in which the player controls a car and runs over stick figure "gremlins" reminiscent of people, Exidy created a nearly identical

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[190] "Video Games: A Public Perspective." Digital copies of this video are hosted at http://www.atarimania.com/list_videos_atari-___A.html (accessed 11/25/14); https://www.youtube.com/watch?v=7gBWDlr3Rx0 (accessed 11/25/14).

[191] Though Atari sought to combat negative images of video arcade games, it counteracted its own message in regards to home video games. A 1981 Atari VCS commercial featured a concerned mother describing how her son, daughter, and husband are obsessed with various video games. She asks "is this problem contagious?" A screen with the Atari logo follows with the tag line "it's more than a game, it's an addiction." It was one of three "Atari Anonymous" television commercials. All involved a concerned mother calling Atari and asking for help dealing with the video game addiction of a family member or members. The ad campaign ran contrary to Atari's efforts to convince the public that arcade games were harmless fun. "Atari commercial storyboard." Steve Bristow Papers, Box 14, Folder 9.

sequel to cash in on the publicity. Company founder Pete Kauffman explained "It seemed like the more controversy… the more our sales increased."[192] Some producers described their games in addictive terms to appeal to mediators. Williams advertised *Moon Patrol* (1982) with the tag line "An incredible thing happens when a person takes control of Williams *Moon Patrol*... He can't let go!"[193] A flyer for Gottlieb's *Q*bert* (1982) stated "kids Qan't Quit with just one Qontest, so Qoins keep Qollecting in Q*bert's Qashbox."[194] Flyers for Exidy's *Spectar* (1980) began with phrase "Careful! A SPECTAR is waiting in ambush, ready to hook you to every-changing excitement and challenge! This space-spectacular will hit you when you least expect it, and never let you go!"[195] Such design features and advertising methods countered attempts to convince a vocal subset of non-users that video arcade games were beneficial at best and harmless at worst.

Part Six - The Decline of Video Arcade Games

As described in chapter one, the 1983 North American video game crash was the beginning of the end for Atari, Bally, and several other companies as video arcade game producers. The industry continued on (especially in Japan, where video arcade games retained their appeal) and saw brief resurgence in the early 1990s due the popularity of the fighting genre, but it never again served as the primary driver of video game

[192] Pete Kauffman, as quoted in Kent, p. 92.
[193] "*Moon Patrol*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=693&image=2 (accessed 11/25/14).
[194] "*Q*Bert*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=836&image=1 (accessed 11/25/14).
[195] "*Spectar*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=1825&image=2 (accessed 11/25/14).

technology. Atari was the catalyst of the crash, and it's worth examining how its approaches, attitudes, and actions contributed to the decline of video arcade games.

Home Consoles as Paradigm

In the late 1970s video arcade game producers branched out into home electronics with varying degrees of success. Magnavox released the Odyssey home console in August of 1972, a little more than three months before *Pong*. It saw limited sales due to a high price tag, poor marketing, unfamiliar technology, and poor game design.[196] Atari had greater success with its home versions of *Pong*, mostly due to an initial 75,000 unit order from Sears-Roebuck.[197] The large sale motivated Atari to move forward with its home electronics efforts and develop the Atari VCS console. Other companies released *Pong* clones as home electronics, including National Semiconductor and Texas Instruments. Coleco's Telestar home console had several iterations and moderate success between 1976 and 1978.

When Warner purchased Atari in 1976 its corporate vision was centered on home entertainment. *Television Digest* wrote that Warner viewed video games as an "integral part of emerging home video systems industry" rather than a coin-op fad.[198] Warner saw the potential in integrating video games into cable TV via a two-way communication system, and Warner Cable chairman Gustave Hauser stated "Games on TV by using the cable are something we've been thinking of for a couple of years."[199] Early in its

[196] Ralph Baer, as quoted in Kent, p. 25.
[197] "Contract of Purchase, 3/16/1975." Al Alcorn Papers, Box 1, Folder 7.
[198] *Television Digest*, Vol. 16, No. 37, p. 11. Steve Bristow Papers, Box 3, Folder 1.
[199] *Television Digest*, Vol. 16, No. 37, p. 11. Steve Bristow Papers, Box 3, Folder 1.

existence Atari self-identified with a pre-existing coin-op industry. It envisioned itself based upon that model, and it developed, marketed, and distributed its games with coin-op practices in mind. It continued to do so after being purchased by Warner. However, the acquisition marked the beginning of a shift towards video games as home electronics played on consoles rather than coin-op amusement devices. By the early 1980s, it was clear that Warner viewed Atari's coin-op division as a side project rather than a core business component.[200]

Exodus from Atari

Atari's original corporate culture clashed with its new parent company. From 1972 to at least late in 1976, life at Atari was informed by Bay Area culture.[201] Most employees were young and some, most famously Apple founder Steve Jobs, were avid drug users and outside-the-box thinkers. Besides holding meetings in hot tubs, Bushnell used to entertain factory workers by riding around the conveyor belt in a box, calling it "surfing the line."[202] One day Alcorn and Gene Lipkin, who was vice president of sales, reportedly walked into the office of Frank Ballouz, the coin-op division marketing manager. When they discovered Ballouz on an important phone call, Lipkin set the papers in his inbox on fire to get his attention. Ballouz's legendary response was "A couple of VPs just lit the papers on my desk on fire. If it's all right with them, it's all right with me."[203] Such pranks were commonplace in the recollections of former Atari

[200] Kent, p. 133.
[201] Alcorn. IEEE Global History Network
[202] Kent, p. 86.
[203] Kent, p. 135.

developers and were integral to company mythos.[204] They were not entirely contained within the company, either. An errata page included in the manual for *LeMans* in 1976 came with the headline "SOMEBODY MADE AN ERROR IN THIS BOOC AND THIS PAGE IS HERE TO CORREKT IT!" The Atari logo printed next to it was deliberately off-center and partially obscured.[205]

The Warner executives brought in to oversee Atari were unused to the chaotic and creative environment of Atari developers. Ray Kassar, who was initially Warner's representative at Atari, had a background in textiles and was notoriously disconnected from the creative process of video game development.[206] He neither partook in nor was amused by the antics of Atari employees. Within the first two weeks of Atari's sale, Kassar entered a meeting with Atari management. He recalled that Bushnell was wearing a T-shirt that read "I love to screw."[207] Everyone was "drinking beer and smoking marijuana."[208] When offered a joint, Kassar refused. Bushnell seemed taken aback, and after a brief uncomfortable exchange in which Bushnell admitted that the purpose of the meeting was to "relax," Kassar left the room.[209]

The clash in vision and management styles led many early Atari employees to leave the company. Bushnell was continually frustrated with Warner's decisions and felt that upper management was disconnected from the actual business. In November of 1978 a meeting with Warner executives in New York "erupted into a shouting match" about

[204] Ed Rotberg, as quoted in Kent, p. 133, 135.
[205] "*LeMans* Service Manual." Steve Bristow Papers, Box 12, Folder 12.
[206] Alan Miller, as quoted in Kent, p. 113.
[207] Ray Kassar, as quoted in Kent, p. 110.
[208] Ray Kassar, as quoted in Kent, p. 110.
[209] Ray Kassar, as quoted in Kent, p. 110.

VCS pricing.[210] Bushnell was dismissed from the company shortly thereafter and Kassar was appointed to replace him as CEO. Kassar's style was described as "autocratic" and was unpopular with longtime employees.[211] He brought in outside people with experience in other industries who, according to Alcorn, "really didn't understand this business."[212] Atari President Joe Keenan left the company two months after Bushnell. Gil Williams, longtime head of manufacturing, left in 1980, and eventually Gene Lipkin as well. Alcorn soon became upset at the lack of support for innovation shown by the new management. When in 1981 Kassar refused to release "Cosmos," an innovative home console developed by Alcorn that used holographic overlays, despite 8,000 pre-orders, Alcorn quit. He stated "Indeed, the fact is that after Ray Kassar kicked in, no new products were introduced, none whatsoever. Even, there was a whole division after I left, the AtariTel division, a whole division, they never released a product. I mean, what's going on? So that was the death of the company."[213]

Bristow was continually frustrated with the way that Warner management handled employees. His notebooks from the early 1980s consistently mention the departure of key personnel.[214] Changes to established plans and "misdirection" were common enough as to dishearten the rank and file.[215] Bristow also specifically complained about the "botching of personnel matters," especially "Alcorn's messy departure," which had culminated in a lawsuit after Warner attempted to deny him a promised retirement

[210] Bushnell, as quoted in Kent, p. 111; Kent, p. 111.
[211] Kent, p. 109, 113; Miller, as quoted in Kent, p. 113.
[212] Alcorn, April 26, 2009 and May 23, 2008.
[213] Alcorn, April 26, 2009 and May 23, 2008.
[214] Multiple engineering notebooks. Steve Bristow Papers, Box 1, Folder 6-7.
[215] "Engineering Notebook." Steve Bristow Papers, Box 1, Folder 7, p. 111.

package.[216] Bristow also rankled at the lack of respect shown by Warner management towards people working to develop new products.[217] He felt that innovation structures were increasingly "atomized" and "duplicated."[218] Communication between engineering teams was poor, both on a technical and a business level.[219] Alcorn's initial research and development group had been shut down in an effort to cut costs, and its successor was an unwanted "orphan" that was given little meaningful work.[220]

Problems mounted between Warner management and Atari's remaining stable of video arcade game developers. As described by journalist Stephen Kent,

> After Bushnell left Atari, the people in the coin-operated games division began feeling alienated from other Atari personnel. Though they created many major hits – and Atari's bestselling cartridges were based on their arcade hits - the coin-operated game designers felt unappreciated by Ray Kassar, who focused most of his attention on home sales. Even worse, Kassar offered more praise to designers who adapted arcade games for the VCS than to the coin-op engineers who first created them.[221]

Relations degraded when Kassar called Atari developers "high-strung prima donnas" in an interview with *Fortune* magazine.[222] Ed Rotberg, who developed the hit coin-op *Battlezone* (1980), said of the division "Even though we were creating a lot of the titles

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[216] "Engineering Notebook." Steve Bristow Papers, Box 1, Folder 7, p. 9; "Engineering Notebook." Steve Bristow Papers, Box 2, Folder 1, p. 104.
[217] "Engineering Notebook." Steve Bristow Papers, Box 2, Folder 4, p. 18.
[218] "Engineering Notebook." Steve Bristow Papers, Box 2, Folder 1, p. 103.
[219] "Engineering Notebook." Steve Bristow Papers, Box 1, Folder 7, p. 9; "Engineering Notebook." Steve Bristow Papers, Box 2, Folder 1, p. 104.
[220] "Engineering Notebook." Steve Bristow Papers, Box 1, Folder 7, p. 9; "Engineering Notebook." Steve Bristow Papers, Box 2, Folder 1, p. 104.
[221] It's unclear why most Atari VCS games were based upon video arcade games, but it's probable that the latter's high price tag afforded for expensive technological components and therefore more possibilities to develop quality games. Kent, p. 133.
[222] Ray Kassar, as quoted in Triston Donovan. "The Replay Interviews: Ray Kassar," *Gamasutra*, April 29, 2011. http://www.gamasutra.com/view/feature/134733/the_replay_interviews_ray_kassar.php (accessed 12/1/14); Kent, p. 133.

that were the cornerstone for the consumer part our business, we were kind of anonymous to certain extent."[223] Ed Logg said of Kassar "Ray always came off aloof to us. Outside of official tours, he only made one unannounced visit to the division, and that one day, nobody was in engineering. We all went out to see *Raiders of the Lost Ark*."[224] Such events probably did not sit well with Warner personnel or Kassar's East Coast business sensibilities. He later said of the culture clash that "we're all more serious in the East. You have a job and you do it the best you can and, you know, it's not a playground."[225] The dour sentiment was antithetical to Atari's underlying ethos.

Many experienced game developers left Atari between 1979 and 1982. Alan Miller, a VCS game designer, was one of the first to go. He explained,

> Under the Kassar regime, management became sort of brain dead about technology. They didn't know the limitations of technology. The straw that broke the camel's back was that we lost respect for Atari. They were not committed to doing great stuff anymore. That was a huge change from when we all started there. When we started, we were very idealistic, hardworking, and committed to creating great stuff.[226]

Miller left in 1979 with fellow engineers David Crane, Larry Kaplan, and Bob Whitehead to form the successful third party-publisher Activision. *Arcade Express* later described Activision as "the company which continues to scoop up the top talent in the field."[227] A group of engineers led by Dennis Koble left in 1981 to form a software company called

[223] Rotberg, as quoted in Kent, p. 133.
[224] Ed Logg, as quoted in Kent, p. 133.
[225] Kassar, interview with Donovan, April 29, 2011.
[226] Miller, as quoted in Kent, p. 191.
[227] Joyce Worley, ed. "Programmer Moves from Sears to Actv." *Arcade Express*, Vol. 1, No. 2, August 20, 1982, p. 5.

Imagic.[228] Bristow laconically wrote in one of his engineering notebooks "Koble – leaving – hurts."[229] Dona Bailey quit the company in 1982. In an article in *Blip* about the design of *Centipede*, Bailey said that she left because "There got to be too many people there. The design group I was in became three or four times larger than it had been earlier. It was tough getting that many people to agree on anything. I had been spoiled."[230] The article described Atari in 1980 as a relaxed, fun and creative environment, a "candy factory." That had changed by 1982, and Atari "just wasn't a candy factory anymore."[231] Bill Kunkel, one of the first video game journalists, later opined of the situation "After every quality designer in the company left, Atari went, 'Gee, we're gonna lose all our designers.' Talk about closing the barn door after the horses have left."[232]

Warner's influence on Atari and the 1983 crash are worth examining. Though it provided capital that was instrumental to Atari's growth and success, within three years Warner management had drastically changed corporate culture in ways that alienated long-time employees and stifled innovation. As described by Kent, "Atari had deeply rooted problems [in 1982] that eventually infected the entire video game industry."[233] It became "top-heavy with marketers and other executives" who believed "they could sell anything as long as it came packaged as a video game," no matter how bad the concept or design.[234] Don Valentine, a notoriously serious businessman who sat on Atari's board

[228] "Engineering Notebook." Steve Bristow Papers, Box 2, Folder 2, p. 9-11,
[229] "Engineering Notebook." Steve Bristow Papers, Box 2, Folder 2, p. 12.
[230] Joe Claro, ed. "Dona and the Candy Factory," *Blip*, Vol. 1, No. 4, May 1983, p. 8.
[231] Claro, ed., p. 8.
[232] Bill Kunkel, as quoted in Kent, p. 195.
[233] Kent, p. 235.
[234] Kent, p. 235; Steven Race, as quoted in Kent, p. 235-236.

beginning in 1975 and went on to be one of the most successful Silicon Valley venture capitalists, offered some insights about the Bushnell era versus the Kassar era:

> Atari – you go on the factory tour and the marijuana in the air would knock you to your knees – where they were manufacturing the product. We had board meetings in a hot tub, with bottles of Ripple floating around the hot tub! There are no rules that say that certain behavior produces a result that's directly related to the behavior. I think when you do that you get big companies that die, like our automotive companies. They have so many rules, so many things that they do and have long since forgotten why, that it takes a different attitude. Now, I don't go around advocating marijuana-smoking in the manufacturing area, but that's the way Nolan [Bushnell] ran the company.[235]

The technological and thematic stagnation of video arcade games that began in 1982 took place in part due to Warner priorities, and the company's mismanagement and lack of quality control over third-party VCS cartridges is often cited as a root cause for the '83 crash.[236] Atari under Warner cannot receive sole blame for an industry-wide collapse. But as the first and largest company in the video game industry, its business practices were a major contributing factor.

Moving Away from Video Arcade Games

An industry transition away from video arcade games and towards home consoles was already underway when the 1983 industry crash took place. The VCS had been a remarkable success (at least at first) and had proven the viability of video games as home

[235] Donald T. Valentine. Oral history by Sally Smith Hughes, Regional Oral History Office, The Bancroft Library, University of California, Berkeley, October 20, 2009.
[236] Roger C. Sharpe. "Paradise Lost: Why players left and how to get them back," *Play Meter*, Vol. 10, No. 20, November 1984, p. 59.

electronics. Halfway through 1982 Atari accounted for "59% of the operating capital" for Warner Communications due to its combined VCS and coin-op sales.[237] Other producers also saw growing success in home video games. Mattel generated excellent profits in the second-quarter of 1982 due to a $55.1 million rise in electronics division income from the previous year. It attributed the uptick to "significantly higher shipments of Intellivision Master Components and video game cartridges."[238] Between third-quarter 1981 and third-quarter 1982 Coleco's earnings more than octupled and its sales more than tripled. Seventy percent of profits came from the booming sale of home video games.[239] These consoles faltered in the wake of the crash, but were soon replaced by the Nintendo Entertainment System (NES) in 1985 and the Sega Master System in 1986. Both were successful, and Nintendo and Sega would replace Atari and Bally as the leaders of the video game industry for the next decade.

As home video games replaced video arcade games as a paradigmatic technology, design and development changed. Producing video games for home consoles was different from producing them for coin-op. Most importantly, the single, upfront purchase price of a home video game meant that some previous design constraints could be ignored. As described by game designer Pat Ransil,

> The arcade game has to be designed to play for only ninety seconds, at least as far as the beginning player is concerned. At that point, the player 'loses,' and another quarter has to be inserted. There's nothing like that in the case of

[237] Worley, ed., August 30, 1982, p. 5.
[238] Joyce Worley, ed. "Mattel has Second Quarter Increase: Declares Dividend," *Arcade Express*, Vol. 1, No. 6, October 24, 1982, p. 5.
[239] Joyce Worley ed. "Coleco's Profits Have 800% Increase," *Arcade Express*, Vol. 1, No. 8, November 21, 1982, p. 2.

> cartridges played at home. Your chief motive is to make the game enjoyable. You make it last for hours, if you want.[240]

The rise of home consoles, combined with a notable increase in PC-gaming, meant that game developers could add complexity to video games. They could explore new themes, core aesthetics, and gameplay elements that would have been impossible under coin-op, and in the following years they frequently did so. It is no coincidence that expansive console games such as *The Legend of Zelda* (1987) only appeared after the paradigm shift, or that what Matt Barton called the "Golden Age" of computer games began in 1985.[241] But as video games transitioned into the home they lost (at least for a time) many of the social and competitive aspects that were core aesthetics of video arcade games.

[240] Sullivan, July 1983, p. 4.
[241] Matt Barton. *Dungeons & Desktops: The History of Computer Role-Playing Games* (Boca Raton: CRC Press, 2008), p. 12.

Chapter Three - Mediators

This chapter focuses on mediators, defined as individuals or businesses that purchased, distributed, and operated video arcade games. I argue that mediators were influential actors in the history of video arcade games. The vast majority of video arcade games were purchased by mediators, and they influenced technological design through market feedback. They also chose where and how to place video arcade games for use, defining much of the context of play. I analyze mediator practices to show how their interactions with producers (actors that undertook and/or oversaw the creation and production of video arcade games) and users (actors who played video arcade games and patronized video arcade game spaces) influenced the development and social characteristics of video arcade games.

Part One - Distilling the Mediator Perspective

I glean the mediator perspective through coin-operated (coin-op) trade publications, industry materials, and various contemporary accounts. The coin-op amusement industry trade magazines *Play Meter*, edited by Ralph Lally, and *RePlay*, edited by Ed Adlum, provide insight into behaviors, strategies, and concerns. *Play Meter* is especially valuable because it critically examined coin-op amusement technologies and mediator practices. Additional mediator writings appear as letters to the editor or op-ed pieces in a variety of newspapers. Historical images of video arcade game spaces (public areas where coin-op amusement technologies were placed for use) illustrate mediator goals and philosophies through design features and spatial layout. Certain mediator

practices and attitudes are detailed in archival materials related to Atari, Inc., the first video arcade game company and the industry's most influential producer from 1972 to 1983. Company business plans include frank analyses of mediator preferences and their influences on video arcade game development. Press kits, engineering notebooks, and a collection of newspaper clippings provide additional information. The combined data set lends itself to a robust examination of the role of mediators in the history of video arcade games.

There were two primary categories of video arcade game mediators. "Distributors" bought machines direct from manufacturers, such as Atari and Bally, and formed the "financial base of the industry."[1] Two years after the release of *Pong* (1972) there were roughly 300 coin-op distribution companies in the United States.[2] Their businesses varied greatly in terms of size. The largest ranged from two to ten million dollars in annual sales. A significant number were run by independent businessmen who operated single offices, but some organized their efforts into a chain of regional offices. Most had been in business since at least the 1950s. According to Atari, "This industry has historically been dominated by a few medium-size, family-owned companies… Distributors like Banner in Philadelphia and Lieberman in Minneapolis have controlled their local markets for generations."[3] Most had exclusive licenses with manufacturers to supply a single brand of a given technology in an assigned territory. Distributors were

[1] "The Industry." Atari, Inc. Business Plans, 1974-1975, Stanford University Special Collections, Stanford University Libraries, Stanford, CA, 1974-1975, Box 1, Folder 2.
[2] Atari estimates are inconsistent and range from 115 to 300. Given the size of the industry and the prevalence of mid-sized distributors, I am inclined to trust the larger number. "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1; "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[3] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.

expected to maintain a service department for complex repairs involving electrical (or, later, electronic and computer) rather than mechanical problems.[4]

"Operators" obtained machines through distributors "on a cash, rental, lease, or even profit sharing arrangement."[5] In 1974 Atari estimated the number of coin-op amusement machine operators to be between 20,000 and 30,000 in the U.S. alone.[6] Each was responsible for "about 150 machines," though there was "much spread between the small operators who run no more than five machines and nationwide organizations" that had "thousands of games on location."[7] Operators placed coin-op amusement technologies on location and transported them from site to site. After installation the operator was expected to perform basic maintenance, through their own means if possible or through a distributor if a problem was beyond them. Operators collected coins on-site roughly once per week and regularly rotated machines between locations in order to maintain novelty and consumer interest. Atari explained "The Operator frequently buttons up a location on contract, and promises to reshuffle games in case revenues from certain games begin to fall off. Actively shifting games and keeping his locations 'refreshed' with the newest equipment is the key to Operator success."[8]

Both distributors and operators typically followed the established practices of the coin-operated amusement industry, which encompassed pinball machines, jukeboxes, electromechanical novelty games, and assorted other coin-op devices. Over the years

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[4] "Game Distribution Policies." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[5] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[6] Two different Atari documents from 1974 state 20,000 and 30,000, respectively. The operator population is difficult to track with accuracy, and I have therefore included the range. "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[7] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[8] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

mediators had developed a proven system of mutual support and risk sharing between operators and distributors.[9] Distributors formed a ready and accessible marketplace for operators to procure both new and used machines. Many enabled trade-ins, rentals, and profit-sharing arrangements that reduced operator risk and overall expenses.[10] Distributors maintained a local inventory of replacement parts that reduced machine downtime following a malfunction.[11] Operators in turn provided distributors a measure of protection from fluctuations in coin-op revenue, which was prone to both fads and seasonal usage patterns.[12] Though the coin-op industry was in decline before the introduction of *Pong* due to waning jukebox revenues, the typical mediator in the early 1970s adhered to traditional models.[13] Many of the same people who formulated industry practices during the jukebox boom of the 1950s were still influential in the early 1970s and resistant to change.[14]

Mediators faced social and economic barriers due to the association between coin-op technologies and organized crime. As discussed in chapter one, pinball machines were characterized as gambling devices in the 1940s. As a result they were socially acceptable only in certain areas, many of them seedy. In the early 1970s pinball machines were still illegal in some areas, including New York, Chicago, and Los Angeles.[15] Public perceptions of coin-op amusements as criminal devices characterized other coin-op technologies as they were introduced. The jukebox, for example, faired only slightly

[9] Michael Mendelsohn. "Analysis: The Saturation Point," *Play Meter*, Vol. 7, No. 23, December 1981, p. 36-37.
[10] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[11] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[12] Ralph Lally, ed. 'Atari Moves Manufacturing Division,' *Play Meter*, Vol. 10, No. 10, June 1984, p. 15.
[13] "Space-Age Pinball," *Time*, April 1, 1974. Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[14] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[15] Ralph Lally. "From the Editor," *Play Meter*, Vol. 6, No. 1, January 1980, p. 4.

better than pinball. Ed Adlum, who started his career as a coin-op amusement journalist in 1964, remembered "Jukebox was considered within our industry to be a dirty word. It was a word associated with organized crime that would bring up images of racketeering, and we bent over backward to call it anything but a jukebox. My favorite was 'coin-activated musical device.'" [16] There was a pervasive assumption that "all people who own jukeboxes are crooks."[17]

Part Two - Distributing and Operating Video Arcade Games

When the first video arcade games were introduced their future was uncertain. Though *Pong* generated high revenues for mediators, the long-term financial viability of video arcade games was unclear. Mediators questioned whether the new computer technologies would retain user appeal and, if so, where and how they should be placed. They worried over the maintenance requirements of intimidating internal architecture and balked at the price of machines that became "cobbywebby" and "useless" as novelty wore off.[18] However, the reluctance of some mediators to embrace new technologies presented opportunities to other mediators. An influx of new entrepreneurs came to operate video arcade games. They changed mediator practices in ways that had ramifications for the entire coin-op amusement industry.

[16] Ed Adlum, as quoted in Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001), p. 50.
[17] Adlum, as quoted in Kent, p. 50.
[18] Ralph Lally, ed. "Video converters welcome," *Play Meter*, Vol. 1, No. 5, April 1975, p. 7.

Initial Mediator Responses

Pong appealed to mediators primarily because it was profitable. The video and computer technology it utilized was novel and generated user interest. In 1972 a well-placed pinball machine, novelty game, or jukebox might earn upwards of $50 per week. *Pong* machines could make more than $200.[19] Adlum described *Pong* as "a highly skillful game" that drew users because "more you play the better you get, and the better you get the more you want to play."[20] It held attraction despite a higher price per play (25 cents) than pinball machines and most other coin-op amusements (10 cents). Alcorn recalled "What were the plays on the other pinball machines then? A quarter plays? No, they were ten cents. A quarter would get you three plays… one of the reasons *Pong* was so successful was the fact that it earned quarters, and the operators loved it because they had revenue, they had big revenue all of a sudden. It was a popular game. We broke the ten cent barrier with that machine."[21]

The advent of video arcade games gave new life to the declining coin-op amusement industry. *Time* magazine described "Besides giving birth to a nationwide fad, the [video arcade games] have also revived the sagging coin-game industry, boosting its revenues and ushering in a new era of cutthroat competition between manufacturers."[22] Video games were a catalyst for innovation in the coin-op industry as a whole, and various machines were expected (and later did) incorporate electronic and/or computer

[19] Kent, p. 53.
[20] "A Red-Hot Market for Video Games." *Business Week*, November 10, 1973. Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[21] Allan Alcorn. "First-Hand: The Development of Pong: Early Days of Atari and the Video Game Industry," *IEEE First-Hand Histories* (http://ieeeghn.org/wiki6/index.php/First-Hand:The_Development_of_Pong:_Early_Days_of_Atari_and_the_Video_Game_Industry, accessed 3/11/14).
[22] "Space-Age Pinball." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.

technologies.[23] As early as 1975, Ralph Lally wrote "The coin-operated music and amusement industry entered the Space Age several years go. That entry caused an upheaval that continues to affect our daily business lives and thinking, but it is only a beginning."[24]

Based on these accounts it would be easy to conclude that after the release of *Pong* the future success of video arcade games was fait accompli.[25] The reality was not so simple. After *Pong* video arcade games were still only one aspect of the coin-op amusement milieu. *Play Meter* ran articles on pinball machines and jukeboxes as readily as video arcade games, and there was no sense that one type of technology held primacy.[26] If anything, it seemed that video arcade games were becoming obsolete. Lally spoke in April of 1975 of the "frustration and anger long-felt by operators and distributors toward the upright video tennis-type game" because it no longer held user interest.[27]

In reality, the video arcade games that followed *Pong* were met with skepticism. Many mediators were intimidated by the high cost and the unfamiliar computer technology of early video arcade games. Lally later described that "many operators were outraged at first over the prices the early video games sold for."[28] The cost seemed incommensurate with the "virtually empty cabinet" that mediators were "shocked to find"

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[23] Ralph Lally. "Tomorrow comes today for successful ops," *Play Meter*, Vol. 1, No. 10, October 1975, p. 44.
[24] Lally, October 1975, p. 40.
[25] See, for example, Scott Cohen. *Zap: the Rise and Fall of Atari* (New York: McGraw-Hill, 1984), p. 29-30; Marty Goldberg and Curt Vendel. *Atari, Inc.: Business is Fun* (Carmel: Syzygy Company Press, 2012), p. 4; Kent, p. 37-48.
[26] Gary Bradley. "Atmosphere, architecture, games galore," *Play Meter,* Vol. 1, No. 6, May 1975, p. 38; Lally, October 1975, p. 40-44.
[27] Lally, ed., April 1975, p. 7.
[28] Lally, October 1975, p. 41.

"inside their new "$1,100 video game."[29] After noticing the empty space, mediators would look at the circuit boards and unfamiliar internal architecture and think "how am I going to fix this thing when it breaks?"[30] Matters were made worse because *Pong* spawned a flood of similar games with few differentiating features. Mediators were initially "misled by the sudden success of the novel games" and "proceeded to over-buy and saturate the entire market with games that were all too similar in appearance and performance."[31] Profits decreased and many mediators stopped purchasing video arcade games.[32]

After initial enthusiasm for video arcade games died down, mediators were split on whether they constituted a worthy investment. "Conventional" operators and distributors thought that video arcade games were a passing fad. According to *Play Meter* "the overpopulation and sameness of many of the video games almost forced a 'flash-in-the-pan' attitude."[33] The rapid obsolesce of *Pong* and its variants furthermore left some mediators pointing "angrily to their warehouses, stockrooms and garages littered with the long-cold ashes of the upright video tennis type games" when presented with new video arcade games.[34]

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[29] Lally, October 1975, p. 41.
[30] Lally, October 1975, p. 41.
[31] Lally, October 1975, p. 41.
[32] Mediator disenchantment with video arcade games notably contributed to significant decrease in Atari profits in 1974. As a result, Atari absorbed its Kee Games subsidiary and was forced to seek institutional investment to stay afloat. "Atari, Inc. Consolidated Financial Statements: 1973-1974." Al Alcorn Papers, Stanford University Special Collections, Stanford University Libraries, Stanford, CA, Box 1, Folder 3; Kent, p. 67-68, 84-86; Donald T. Valentine. Oral history by Sally Smith Hughes, Regional Oral History Office, The Bancroft Library, University of California, Berkeley, October 20, 2009.
[33] Gene Beley and Sonny Albarado. "Cocktails, anyone? The boob tube pays off," *Play Meter*, Vol. 1, No. 5, April 1975, p. 26.
[34] Lally, ed., April 1975, p. 7. See also Beley and Albarado, April 1975, p. 26.

However, other mediators saw advantages to video arcade games. Due to their "sophisticated" design (relatively quiet and housed in tasteful cabinets) and computer technology, video arcade games were accepted in spaces that other coin-op amusements were not. They held the potential to open up "an immense, un-harvested territory with millions of new, quality locations ripe for plucking."[35] The introduction of the horizontal "cocktail cabinet" (fig. 3-1; fig. 3-2), which unobtrusively doubled as a surface for food and drink, especially helped video arcade games gain acceptance in "hotels, yacht clubs, country clubs and posh cocktail lounges" that "never before would consider anything with a coin chute on it."[36]

The opportunity that video arcade games represented, and the reluctance of some mediators to adopt them, opened the door to "new blood" operators who were usually younger, inexperienced, and "not afraid of electronics technology" or placing coin-op amusements in new locations.[37] They had little difficulty becoming operators because there were few barriers of entry. Due to perceived connections to organized crime, distributors were obligated to sell coin-op amusements to anyone with enough money to pay. Ralph Lally explained in *Play Meter* "… the distributor knows the feds will chew him up if he's caught refusing to sell to someone who wants to buy. I know of an investigation going on now, trying to put a distributor behind bars for supposed violation of the anti-trust laws."[38] Video arcade games became a major aspect of the coin-op amusement industry largely because a group of "new blood" operators embraced the

[35] Beley and Albarado, April 1975, p. 26.
[36] Beley and Albarado, April 1975, p. 26.
[37] Beley and Albarado, April 1975, p. 27; Lally, ed., April 1975, p. 7.
[38] Lally, October 1975, p. 44.

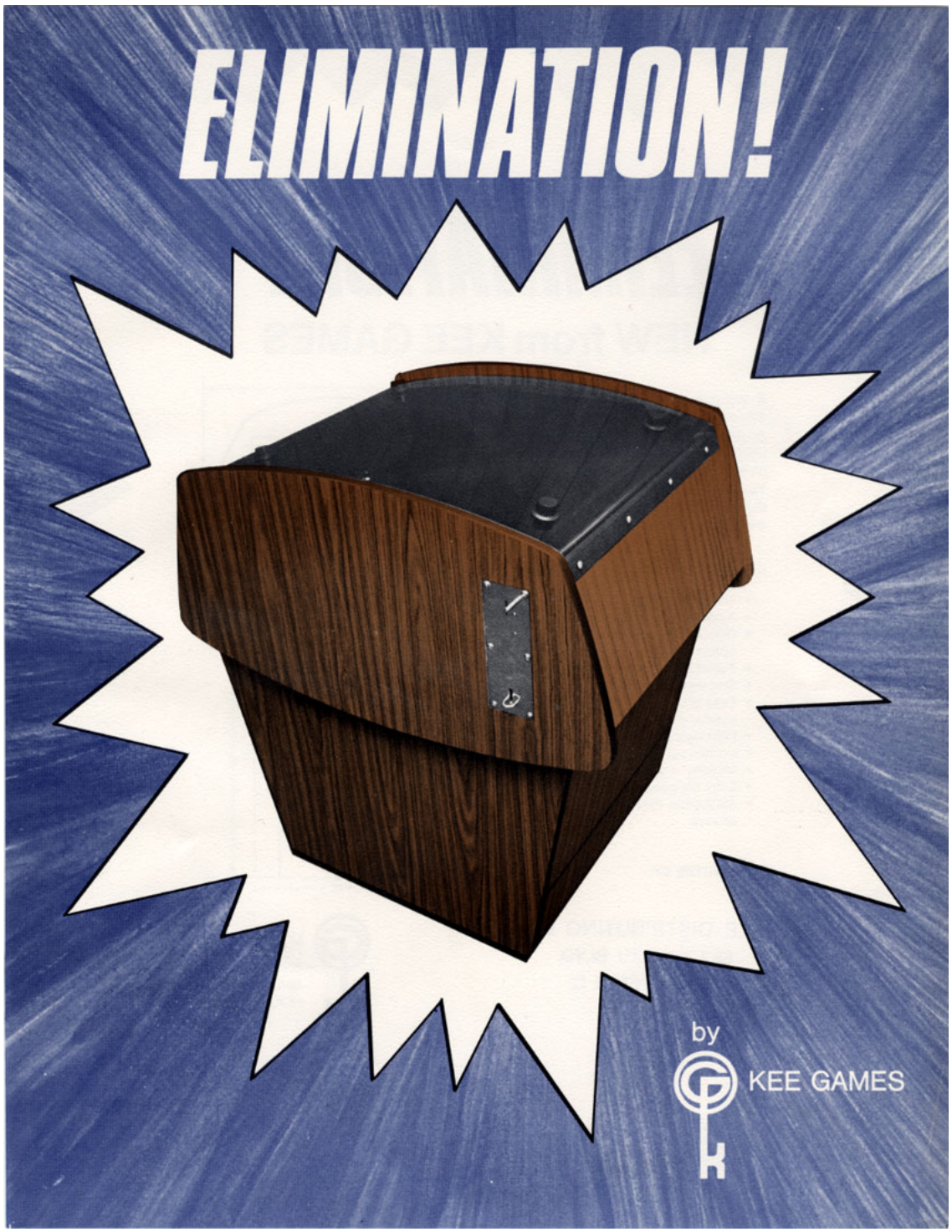

Figure 3 - 1: One of the first "cocktail cabinet" video arcade games. "*Elimination*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=1975&image=1 (accessed 4/18/15)

Figure 3 - 2: "The look of the future is yours today with ELIMINATION! The game can be played anywhere and everywhere." "*Elimination*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=1975&image=2 (accessed 4/18/15)

technology at a time when other mediators rejected it. Lally especially credited the "skepticism" of traditional mediators towards cocktail cabinets for creating an opportunity for newcomers to gain "a foothold within the industry," and in 1980 he noted that many had "become very successful full-line operators."[39] He went on to say of the state of the industry in the mid-1970s "Who would have believed back then that the highest earning piece today would be the video game?"[40]

Early Video Arcade Game Spaces

In the early days of video arcade games, mediators generally did not own the spaces that housed their machines. Distributors primarily did business with operators, and operators were responsible for placing coin-op amusements.[41] Operators typically approached the proprietors of locations such as bars, pool halls, and bowling alleys about installing coin-op amusements on a revenue-sharing basis. Traditionally this was a 50/50 split, though particularly popular coin-op amusements with customer attraction could allow operators to negotiate a higher cut. The arrangement offered benefits to both sides. Proprietors paid operational costs such as rent and utilities but gained additional profits and added a draw to their establishments, and operators were freed from the overhead of maintaining a space.

The first video arcades were opened by Atari rather than traditional coin-op industry personal. In 1974 it introduced "an exciting leisure environment to shopping

[39] Lally, January 1980, p. 4.
[40] Lally, January 1980, p. 4.
[41] Though distributors were obligated to sell to any most distributors demonstrated a preference for their existing economic relationship with operators and did not seek out direct-to-user or direct-to-proprietor sales. Lally, October 1975, p. 44.

centers and other business desiring a profitable, traffic building attraction" in order to "create new markets" for video arcade games. Atari called its proposed model "the Atari Leisure Time Game Center" and described it as "a complete entertainment package" with video arcade games "fully integrated into the décor."[42] Atari had plans to franchise game centers to individuals or investment groups after proving the model's viability with successful test cases, but when implemented they were less lucrative than expected. From June to November of 1975, the majority of Atari's profits stemmed from the sale of video arcade games. The company had $9,439,489 in domestic coin-op sales and $3,568,731 in foreign sales. Its video arcades did a comparatively small business, only $101,349, with a $2,329 loss in November.[43] Atari abandoned the idea and concentrated its efforts on manufacturing and development. Video arcades did not emerge as a significant business model until a surge in public interest surrounding *Space Invaders* (1978) and *Asteroids* (1979) made the model profitable.

Though video arcades were rare, more generalized arcades, which featured a variety of coin-op amusements, proliferated. In the mid-1970s operators increasingly broke from traditional placement partnerships and opened their own arcade spaces in order to increase profits.[44] J.W. Sedlak wrote in a 1976 *Play Meter* article "*Arcades! Game Rooms!* Pick up any of the industry publications these days and you will find that

[42] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[43] "Atari, Inc. Consolidated Financial Statements: Six Months Ended November 29, 1975." Al Alcorn Papers, Box 1, Folder 4.
[44] By "traditional," I am referring to mediator practices dating back to roughly the late 1940s rather than the older coin-op amusement models of penny arcades. David Nasaw. *Going Out:The Rise and Fall of Public Amusements* (New York: Basic Books, 1993), p. 154-158; J.W. Sedlak. "Leasing for an Arcade," *Play Meter*, Vol. 2, No. 9, September 1976, p. 32.

everyone is getting into the act."[45] Arcades followed in the model of older "penny arcades" and featured a variety of devices, including electromechanical novelty games (shooting galleries, mechanical horse races, etc.), skill games (skeeball, mini-basketball shooting, etc.), pinball machines, and video arcade games.[46] Seeing an opportunity (perhaps due in part to the opening up of previously untapped markets enabled by video arcade games), a significant number were created as "family fun centers."[47] *Play Meter* wrote "because of the décor in them and decorum in which they're being run, the new arcades" were "disproving and displacing the 40-year-old stereotyped view that pinball and assorted coin-operated amusement games belong in the same more category as peep shows, switch-blades and corruptors of youth."[48] Family fun centers both benefited from and helped engender a newfound "social acceptance" of coin-op amusements "as an acceptable means of entertainment for middle and upper middle class people."[49] As a result, the number of arcades "tripled and quadrupled in size and income in just a few years" and became "a major economic factor in the industry."[50]

The 'Aladdin's Castle' chain served as a prototype for the revised arcade. It was originally incorporated in 1968 as American Amusements by Jules Millman, a young coin-op amusement operator just starting in the industry. He had joined a Chicago coin-op distribution company after college and soon after began dabbled in operating a few games at his uncle's discount store. At a time when arcades were rare, Millman believed

[45] Sedlak, September 1976, p. 32. Original emphasis.
[46] For a description of penny arcades, see chapter one, "Precursors."
[47] Ralph Lally, ed. "Seamy sister goes straight," *Play Meter*, Vol. 1, No. 6, May 1975, p. 7.
[48] Ralph Lally, ed. "Seamy sister goes straight," *Play Meter*, Vol. 1, No. 6, May 1975, p. 7.
[49] Ralph Lally, ed. "Seamy sister goes straight," *Play Meter*, Vol. 1, No. 6, May 1975, p. 7.
[50] Ralph Lally, ed. "Seamy sister goes straight," *Play Meter*, Vol. 1, No. 6, May 1975, p. 7.

that they could be successful in shopping malls. After being turned down by malls several times due to the social taboo surrounding coin-op amusements, he finally found a mall willing to lease him an unused space. Millman crafted a clean interior that was well-supervised and installed various coin-op amusements. Food and drink were prohibited in the interest of maintaining the machines. The arcade, called "Carousel Time," quickly became a great success not only for Millman, but also for the mall due to increased foot traffic. In only a few years American Amusements expanded to a few dozen arcades in malls across the country and was earning $128 million.[51] It was purchased by Bally in 1973, renamed Aladdin's Castle, and allowed to operate with relative autonomy.[52] It went on to become the largest arcade chain in the country, and in 1980 had 221 locations.[53]

The spread of all-ages, generalized coin-op amusement arcades was contingent upon mediator willingness to try new models. It therefore typically fell to "new blood" entrepreneurs such as Millman. Lally explained "For the most part, the new amusement centers are run by people who grew up in the '60's and who somehow never developed the prejudice against amusement machines that their parents may have held."[54] Though Millman's own involvement pre-dated video arcade games, most "new blood" mediators had entered the industry to operate video arcade games.[55] They brought with them a willingness to embrace both new technologies and new ideas, and arcades proliferated

[51] Ralph Lally, ed. "The arcade genie makes a wish, creates amusement games palaces," *Play Meter*, Vol. 1, No. 6, May 1975, p. 13.
[52] Christian Marfels. *Bally: The World's Game Maker* (Las Vegas: UNLV International Gaming Institute, 2001), p. 106.
[53] Adele Hast. *International Directory of Company Histories, Vol. 3* (Chicago: St. James Press, 1991), p. 430; Marfels, p. 106.
[54] Lally, ed., May 1975, p. 7.
[55] Beley and Albarado, April 1975, p. 27.

due to their influence. The newfound success of arcades caught the attention of more entrepreneurs and brought in even more "new blood." As described by *Play Meter* "more and more people are becoming interested in becoming operators and even distributors, realizing the economic potential in an industry long maligned, but now coming into its own right."[56]

Part Three - Mediators and Market Feedback

By 1976 video arcade games had become an established part of the coin-op amusement industry. *Play Meter*'s annual operator survey found that the average operator in 1976 placed 263 coin-op amusement machines in 87 locations. His (a significant majority of operators were male) inventory consisted of 76 pinball machines, 58 phonographs, 56 video arcade games, 42 pool tables, 18 "soccer tables," 10 shuffle board tables, and 3 "others." Over the course of the year he bought mostly pinball machines. He purchased fewer video arcade games than any other category except for table soccer. Mediators found that video arcade game popularity and profitability were on the rise, but had complaints about the high price of new machines and the lack of manufacturer support. Several cited "lack of communications" as an issue, and one wrote that "if an operator buys a bad game he is stuck with it; the manufacturer will not try to help him."[57] Maintenance difficulties were also a concern. Most operators lacked the training to service video arcade games, there was a dearth of qualified servicemen, and according to *Play Meter* "the myriad of circuit designs and the complexity of video game computers

[56] Lally, ed., May 1975, p. 7.
[57] Ralph Lally, ed. "Survey, '76," *Play Meter*, Vol. 2, No. 8, August 1976, p. 20.

has increased service problems by an order of magnitude for operators without trained digital technicians."[58] When the average operator did buy a video arcade game via a distributor, he preferred Atari products. Though mediators thought that pinball machines were their best earner, their opinion was inconsistent with the reported data. The per machine weekly gross of pinball machines ($35) was near the median for coin-op amusements. Video arcade games ranked third ($40) behind pool tables ($41) and phonographs ($49).

As the largest market for video arcade games, mediators were in a position to make demands of video arcade game producers. At least until the beginning of the Golden Age in 1979, mediators could choose from several economically viable genres of coin-op amusements. They had to be convinced to allocate funds to video arcade games instead of pinball machines or other competing technologies. In order to be successful in the marketplace, producers therefore had to develop products to fit mediator priorities. Due to this economic relationship, mediators influenced production through "market feedback," or preferences and priorities as displayed by purchasing trends. Producers and mediators were in dialogue over the form, function, and developmental paths of video arcade games. While producers had the ultimate say over the technologies they created, the economic viability of their products depended on whether they met mediator desires and needs.

Making Machines for Mediators

[58] Bill Arkush. "Technical Topics," *Play Meter*, Vol. 2, No. 8, August 1976, p. 33.

The ultimate aim of design was to make a technology that coin-op industry mediators would buy. Companies like Atari were successful in part because they understood the mediator point of view. Chairman of the Board Nolan Bushnell, Vice President of Research and Development (and inventor of *Pong*) Al Alcorn, and Vice President of Engineering Steve Bristow had all worked as coin-op amusement operators.[59] Their video arcade game designs were informed by experience with the day-to-day realities of placing and servicing coin-op amusements.[60] Atari held lavish annual distributor meetings in locations such as Pebble Beach and Honolulu to showcase upcoming products and assess distributor wants.[61] Atari also solicited mediator feedback. For example, the service manual for *Tank* (1974) included a statement that "Our games are designed with the customer in mind and we appreciate any and all comments from the field."[62] Later manuals included tear-out business reply mail cards for collecting mediator comments.[63]

Producers designed video arcade games with mediators in mind. The internal architecture of *Computer Space* (1971), one of the first two video arcade games ever built, is an early example. Bushnell, the game's co-designer, knew that in order for video arcade games to succeed in the marketplace they had to be maintainable by people with

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[59] Alcorn, IEEE Global History Network; Nolan Bushnell, as quoted in Kent, p. 29; Nolan Bushnell, as quoted in Morgan Ramsay. *Gamers at Work: Stories Behind the Games People Play* (New York: Apress, 2012), p. 18; Goldberg and Vendel, p. 24, 50, 127.
[60] Alcorn, IEEE Global History Network; Bushnell, as quoted in Kent, p. 29.
[61] "Atari: the First Decade, 1972-1982. The 8th Annual Atari Distributors Meeting." Steve Bristow Papers, Stanford University Special Collections, Stanford University Libraries, Stanford, CA, Box 12, Folder 15; Carol Kantor, ed. *Atari Coin Connection*, Vol. 1, No. 5, April 1977.
[62] "*Tank* Operation and Service Manual, 1974." Steve Bristow Papers, Box 4, Folder 6.
"*Basketball* Operation, Maintenance and Service Manual, 1979." Steve Bristow Papers, Box 7, Folder 4; "*Lunar Lander* Operation, Maintenance and Service Manual, 1979." Steve Bristow Papers, Box 8, Folder 5; "*Subs* Operation, Maintenance and Service Manual, 1979." Steve Bristow Papers, Box 8, Folder 1.

no working knowledge of computers or electronics.[64] Mediators had learned to troubleshoot the mechanical and electromechanical issues presented by other coin-op amusement technologies, but Bushnell correctly assumed that most would be intimidated by computer components.[65] The stated primary goal of *Computer Space* was therefore to "to create a new standard of reliability using the latest technology."[66] Bushnell wrote in the service manual (which in the context of coin-op amusement industry mediation doubled as an advertisement) that it "requires operators to have no more fear of replacing a bad tube than of replacing a bad relay."[67] When maintenance was required, internal architecture was constructed to simplify the task: "[*Computer Space*] has been designed for easy servicing by using modular assemblies rather than requiring the repair of discrete components. Servicing is done by 'removing and replacing' and does not require a technician trained in electronics."[68] Only repairs involving chips were expected to go through Nutting Associates, *Computer Space*'s manufacturer. The company charged to fix broken circuit boards, though "only on the basis of necessary repairs, and not for the whole board."[69] The service manual reassured that "because of the extremely high reliability of integrated circuits" the computer components "should be considered the least likely source of malfunction in all instances."[70]

Computer Space's hardware design established technological reliability and ease of maintenance as crucial design considerations. The first generation of video arcade

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[64]In the business relationship between Bushnell and Dabney, Bushnell handled sales and business strategy. Adlum, as quoted in Kent, p. 33; Al Alcorn, as quoted in Kent, p. 45; Bushnell, as quoted in Ramsay, p. 19.
[65] Beley and Albarado, April 1975, p. 27.
[66] "*Computer Space* Service Manual, 1971." Steve Bristow Papers, Box 6, Folder 5.
[67] "*Computer Space* Service Manual, 1971." Steve Bristow Papers, Box 6, Folder 5.
[68] "*Computer Space* Service Manual, 1971." Steve Bristow Papers, Box 6, Folder 5.
[69] "*Computer Space* Service Manual, 1971." Steve Bristow Papers, Box 6, Folder 5.
[70] "*Computer Space* Service Manual, 1971." Steve Bristow Papers, Box 6, Folder 5.

games, including *Pong*, emulated *Computer Space*'s internal structures.[71] Modularity and minimal moving parts were deliberately emphasized to meet mediator needs.[72] Producers advertised that this model for technological design gave video arcade games an advantage over other coin-op amusements.[73] The service manual for *Qwak!* (1974), an Atari video arcade game that simulated duck hunting, provides one such example. It began with a general information section that included "A Short History of Gun Games."[74] It linked gun games to the "martial preparations" of World War II and went to say "Although no war is in progress today, operators are 'cashing in' on the desire of the public to participate in the technological and electronic revolution, via electronic gun games."[75] The manual then explained the "paramount disadvantage" of pre-existing electromechanical gun games was "the degree of mechanical complexity, a factor which leads to high maintenance and profit reducing down-time."[76] The section declared that "the video game is likely to replace its mechanical brother" because the former "utilizes

[71] Henry Lowood. "Video Games in Computer Space: The Complex History of Pong." *IEEE Annals of the History of Computing*, Vol. 31, No. 3, July-September, 2009, p. 15.
[72] See, for example, "*Qwak* Service Information and Schematics, 1974." Steve Bristow Papers, Box 4, Folder 5, p. 1; "*Tank* Operation and Service Manual, 1974." Steve Bristow Papers, Box 4, Folder 6; "*Gran Trak 10* Operation and Maintenance Manual." Steve Bristow Papers, Box 4, Folder 4.
[73] Advertisements were placed in coin-op amusement trade publications and disseminated to distributors as flyers. Service manuals also doubled as advertisements aimed at mediators. Most included reassurances about profitability and reliability, featured narrative gameplay descriptions designed to excite, and included eye-catching but superfluous illustrations. See, for example, "*4-Player Football* Operation, Maintenance and Service Manual, 1979." Steve Bristow Papers, Box 8, Folder 3; "*Basketball* Operation, Maintenance and Service Manual, 1979." Steve Bristow Papers, Box 7, Folder 4; "*Firefox* Operators Manual." Steve Bristow Papers, Box 9, Folder 12; "*Subs* Operation, Maintenance and Service Manual, 1979." Steve Bristow Papers, Box 8, Folder 1.
[74] "*Qwak* Service Information and Schematics, 1974." Steve Bristow Papers, Box 4, Folder 5.
[75] "*Qwak* Service Information and Schematics, 1974." Steve Bristow Papers, Box 4, Folder 5.
[76] "*Qwak* Service Information and Schematics, 1974." Steve Bristow Papers, Box 4, Folder 5.

solid state circuitry which maximizes function capabilities, minimizes down-time, and simplifies repair."[77]

Mediator priorities affected external as well as internal design. Variants to the "standard" upright cabinet model were created to meet mediator needs. The horizontal "cocktail" cabinet (fig. 3-3), first released in 1973 and popularized by 1975, was designed to be suitable for locations that might be resistant to upright video arcade games.[78] Cocktail cabinets were "low profile" and allowed mediators to place video arcade games in "new locations all over the country."[79] The small, "cabaret" cabinet (fig. 3-4) became common in the early 1980s and was specifically created "to occupy less than 4 square feet of floor space," allowing for mediators to place more video arcade games in less area.[80] Mediators insisted on sturdy cabinets constructed with durable glass and coated with clear, protective acrylic to ward against drink spills, food residue, and cigarette burns, as well as the aggression of disgruntled or overenthusiastic players.[81] Mediator purchasing criteria also limited the viability of certain models. For example, "cockpit" cabinets, larger constructions involving a built-in seat, were considered niche models because their large size limited marketability (fig. 3-5). A larger footprint meant less total

[77] "*Qwak* Service Information and Schematics, 1974." Steve Bristow Papers, Box 4, Folder 5.
[78] Beley and Albarado, April 1975, p. 59.
[79] Lally, January 1980, p. 4.
[80] "Cabaret *Asteroids* Operation, Maintenance and Service Manual, 1980." Steve Bristow Papers, Box 9, Folder 6, p. 3.
[81] Alcorn, IEEE Global History Network.

Figure 3 - 3: A typical cocktail cabinet video arcade game. "*Formula M Vroom*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=6563&image=1 (accessed 4/17/15)

Figure 3 - 4: A "cabaret" cabinet pictured next to a cocktail (bottom) and upright (right) cabinet. "*Galaga*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=424&image=1 (accessed 4/18/15)

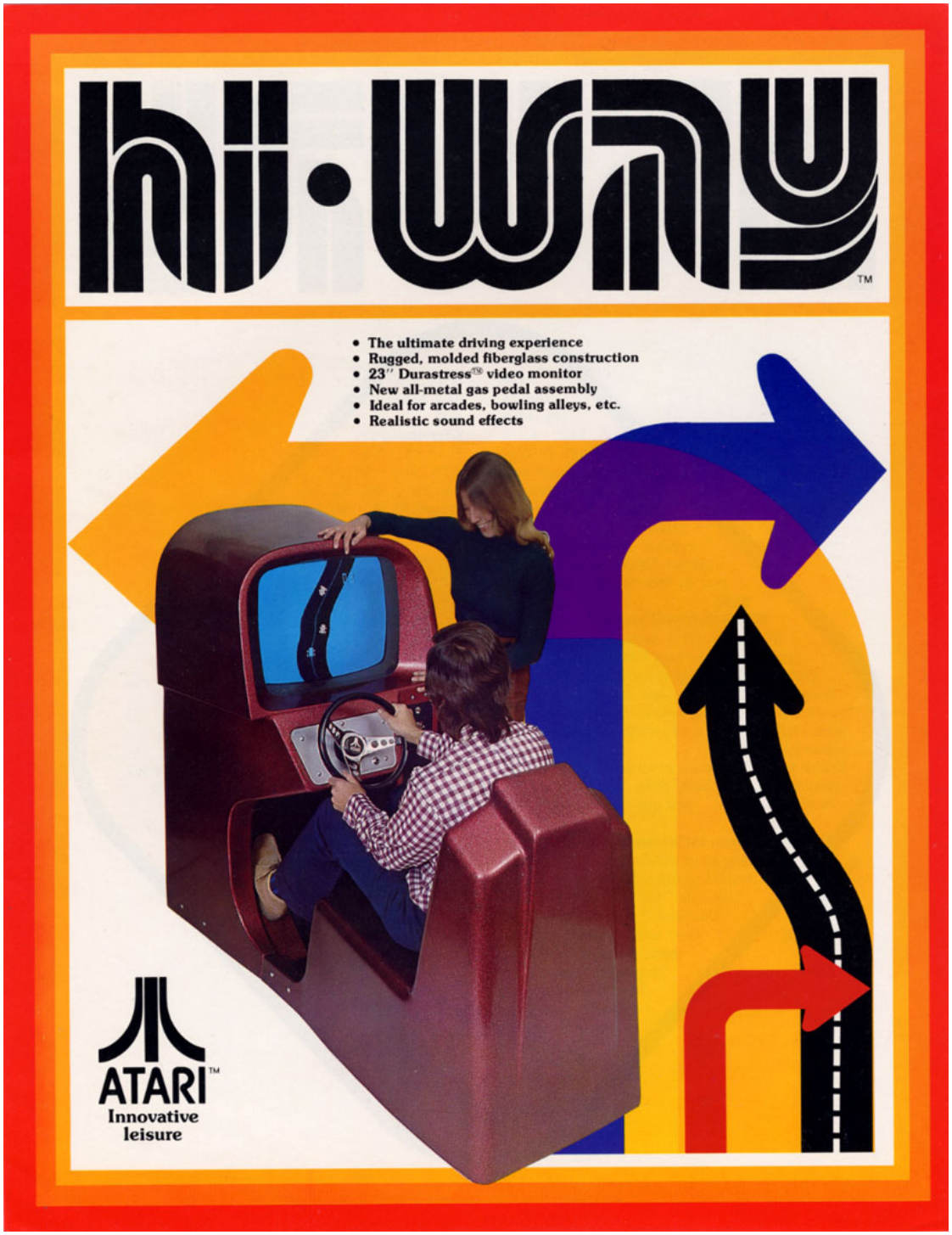

Figure 3 - 5: Atari's *Hi-Way* (1975) was the company's first video arcade game to offer a cockpit cabinet option. It was not a success and few were manufactured. "*Hi-Way*." The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/?page=flyer&db=videodb&id=503&image=1 (accessed 5/20/15)

marketplace, video arcade games were more expensive and earned similar per machine revenues during the 1970s.[82] Nonetheless, they were popular with mediators. Due to an aura of high-tech and aided by the cocktail cabinet, video arcade games allowed mediators to tap new markets new as hotels, airports, movie theaters, and convenience stores. As described by Rodger Sharpe of *Play Meter*, "Flat out fact is that pinball is blue collar through and through, while video has leaped into white collar respectability. Video makes it to the places where pinball *can't* go, and not the other way around."[83] Video arcade games appealed to mediators because they had durable cabinets and made efficient use of space by comparison to other coin-op amusements. They required minimal maintenance. When operator Doug McCallum analyzed video arcade game reliability for *Play Meter*, he wrote that the "neat thing is" video arcade games "don't break" and that despite some "out-of-the-crate-blues" (mainly due to chip failures during the manufacturing process) "once they're up, they stay up." [84] While pinball machines and video arcade games were "proportionally" reliable on a per part basis "there are too many more components subject to failure on a pinball, compared to a video game."[85] When maintenance was required, mediators found that after receiving adequate training video arcade games were "simpler to service than electro-mechanical games such as pinball

[82] Video arcade games outperformed pinball machines in 1976 and tied them for per machine revenue in 1977, but pinball machines were better earners from 1978 through 1979. Market data from the early 1970s is unfortunately unavailable, but based on mediator accounts it's reasonable to assume that video arcade games outperformed pinball machines in 1973, but not from 1974 to 1975. Ralph Lally, ed. "Play Meter Survey Results: Videos sweep to big gains in 1980," *Play Meter*, Vol. 6, No. 21, November 1980, p. 24; Lally, ed., August 1976, p. 20; David Pierson. "The Hit Syndrome," *Play Meter*, Vol. 6, No. 21, November 1980, p. 45.
[83] Rodger C. Sharpe. "Coming of Age: Pins and videos show signs of growing pains," *Play Meter*, Vol. 6, No. 21, November 1980, p. 33.
[84] Doug McCallum. "Questions of Reliability," *Play Meter*, Vol. 6, No. 21, November 1980, p. 46-47.
[85] Zac Oliver. "Videos and Pinballs: Technical Comparisons," *Play Meter*, Vol. 6, No. 21, November 1980, p. 49.

machines" due to having few moving parts and comparatively simple, modular internal architecture.[86]

Controlling Video Arcade Games

In an effort to appeal to mediators, producers relinquished a degree of control over video arcade games. Though at first mediators had few options to change the mechanics of play, producers quickly began to include switches to alter video arcade game parameters. *Tank*, one of the earliest examples, featured a single switch which adjusted cost and length of play (fig. 3-6). It was "preset at the factory" to provide sixty seconds of gameplay for 25 cents, but could be flipped to make games last 120 seconds at 50 cents per play. *Tank*'s operation and service manual explained that the owner could "set this switch as you wish" and adjust parameters "to your convenience."[87] The change was minor, but the first of many small steps that allowed mediators to alter video arcade game parameters to suit their needs.

Though the amount of mediator control available varied from game to game and manufacturer to manufacturer, with some exceptions (including laserdisc video arcade games, discussed below) it increased over time. In *Gran Trak 10* (1974) parameters were functionally static due to the complexity of its software, but *Qwak!* was created in the

[86] Typically producers sent engineers to teach technicians employed by distributors how to maintain unfamiliar video arcade game components. Those technicians handled maintenance for distributors and trained interested operators. Service manuals created by producers, generalized maintenance handbooks, and trouble-shooting articles in *RePlay* and *Play Meter* also served as guides. Perry Miller. "Technical Topics: of VOM's analyzers and outlet testers," *Play Meter*, Vol. 1, No. 6, May 1975, p. 47.
[87] "*Tank* Operation and Service Manual, 1974." Steve Bristow Papers, Box 4, Folder 6.

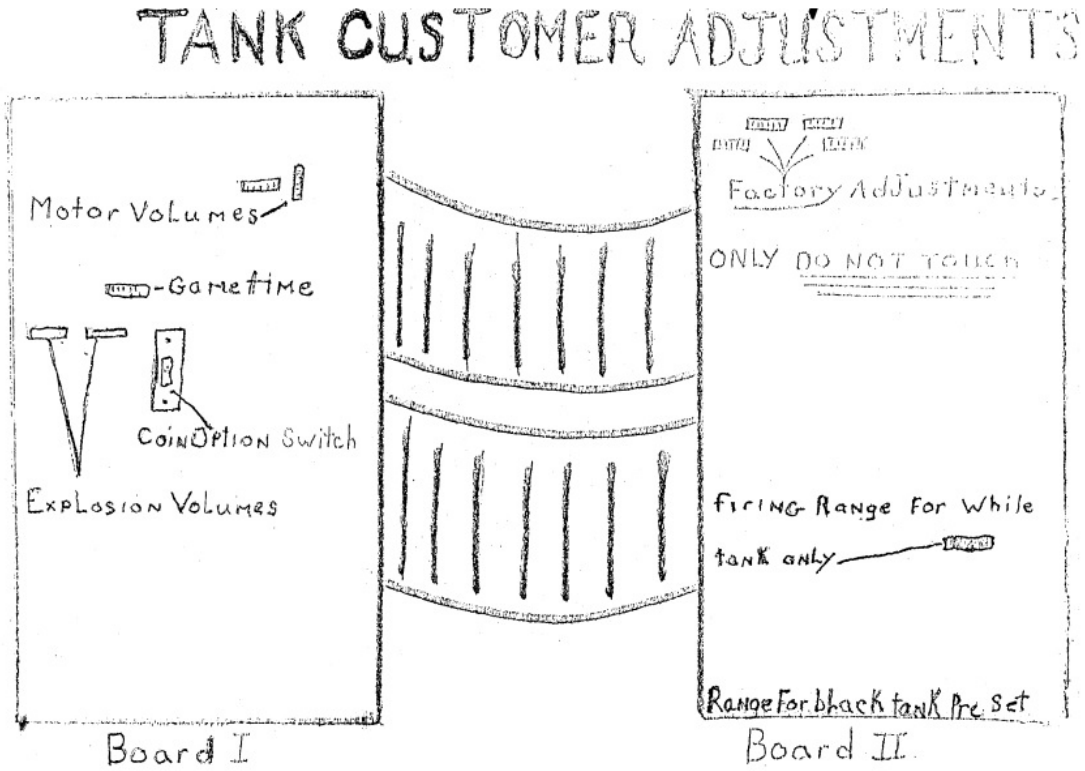

Figure 3 - 6: *"Tank* Operation and Service Manual." The International Arcade Museum. http://www.arcade-museum.com/manuals-videogames/T/Tank.pdf (accessed 4/14/15)

same year and allowed for the alteration of both length and cost.[88] *Flyball* (1976), a baseball video arcade game produced by Atari two years later, contained a six-switch hardware panel that allowed mediators to alter time of play (either one inning or two innings) and price per play (25 cents, 50 centers, or $1).[89] By *Asteroids* (1979) there were eight switches that combined to give several options regarding number of ships per game,

[88] Though play time could be adjusted in *Gran Trak 10* by opening up the cabinet and tinkering with the electronics subassembly, Atari warned that "Playtime is pre-set before shipment and *should not be adjusted* due to interrelationships with other game functions (i.e., crash time, rating system)." Original emphasis. "*Gran Trak 10* Operation and Maintenance Manual, 1974." Steve Bristow Papers, Box 4, Folder 4. See also "*Qwak* Service Information and Schematics, 1974." Steve Bristow Papers, Box 4, Folder 5, p. 5, 7.
[89] "*Flyball* Operation, Maintenance, and Service Manual." Steve Bristow Papers, Box 3, Folder 4, p. 15.

number of coins per game, and display language (English, German, French or Spanish).[90] By *Galaga* (1981), mediators had a variety of control options, including the calculation of player scores (fig. 3-7, fig. 3-8).[91] The ability for mediators to alter video arcade game parameters was beneficial to their business. Price per play could be increased to capitalize on popularity or decreased to sustain revenues after novelty had worn off. Difficulty could be increased if a given set of users had mastered a game, or decreased if they were frustrated.

Video arcade games without mediator control options risked being shunned in the marketplace. For example, laserdisc video arcade games like *Dragon's Lair* (1983) and *M.A.C.H. 3* (1983) could not be altered to play for less than 50 cents without significant (and potentially disastrous) modifications to internal architecture. *Play Meter* explained "Many operators have noticed a player's resistance to spending 50 cents to play a game when the player can step to another game and enjoy 15 minutes of play for a quarter."[92] Without the ability to decrease the price per play after initial enthusiasm had waned, laserdisc games quickly fell out of favor with both mediators and users. A letter published by *Play Meter* in 1984 stated "the words 'laser game' are dirty words" among coin-op amusement mediators "and fortunately we don't have many left."[93]

[90] "*Asteroids* Operation, Maintenance and Service Manual, 1979." The International Arcade Museum. http://www.arcade-museum.com/manuals-videogames/A/Asteroids.pdf (accessed 4/14/15)
[91] "*Galaga* Parts and Operating Manual, 1981." The International Arcade Museum. http://www.arcade-museum.com/manuals-videogames/G/galaga1.pdf (accessed 4/14/15)
[92] Wayne McGuire. "The 25-Cent Dragon," *Play Meter*, Vol. 10, No. 10, June 1984, p. 78.
[93] Ralph Lally, ed. "Distributors and Operators Adapt to a Changing Market," *Play Meter*, Vol. 10, No. 10, June 1984, p. 28.

OPTION SWITCH SETTINGS:

To change the option switch settings, you DO NOT have to take the CPU board out of the game. They can be easily reached through the rear access door on the Upright and Mini models. On the Cocktail Table model, you do have to open the table top to reach them.

When changing any options, ALWAYS perform the Self-Test and play the game to be sure the switches have worked properly and that no switches were accidentally moved that were not meant to be. (These switches are small and this can happen.)

The option switch settings and what they will make the game do are shown in Figure 3. See Figure 2 for option switch locations.

ELIMINATING THE RAPID (AUTOMATIC) FIRE FEATURE

If you do not desire the RAPID (AUTOMATIC) FIRE FEATURE on your game, it can be simply and easily eliminated. See the following procedure.

1. Turn the power off to the game.

Figure 3. Option switch settings

DIP SWITCH 6J

	SW#1	SW#2	SW#3	SW#4	SW#5	SW#6	SW#7	SW#8
1 PLAYER GAME PRESS THE 1 PLAYER START BUTTON 2, 3, 4, OR 5 FIGHTERS	OFF						NOT USED	
2 PLAYER GAME PRESS THE 2 PLAYER START BUTTON 2, 3, 4, OR 5 FIGHTERS **EACH**								
1 PLAYER GAME PRESS THE 1 PLAYER START BUTTON 2, 3, 4, OR 5 FIGHTERS	ON						NOT USED	
1 PLAYER GAME WITH 5, 7, 9, OR 11 FIGHTERS PRESS THE **2 PLAYER** START BUTTON								

DIFFICULTY LEVEL SETTINGS — "A" IS THE EASIEST AND "D" IS THE MOST DIFFICULT

	SW#1	SW#2	SW#3	SW#4	SW#5	SW#6	SW#7	SW#8
RANK "A" - EASIEST LEVEL OF PLAY		OFF	OFF				NOT USED	
RANK "B" - 2ND LEVEL OF DIFFICULTY		ON	ON					
RANK "C" - 3RD LEVEL OF DIFFICULTY		OFF	ON				NOT USED	
RANK "D" - MOST DIFFICULT LEVEL OF PLAY		ON	OFF					

	SW#1	SW#2	SW#3	SW#4	SW#5	SW#6	SW#7	SW#8
GAME PROVIDES SOUND IN **ATTRACT MODE**				ON			NOT USED	
GAME **DOES NOT** PROVIDE SOUND IN **ATTRACT MODE**				OFF				
FREEZE VIDEO (MONITOR PRESENTATION STOPS MOVING)					ON		NOT USED	
MONITOR OPERATES NORMALLY					OFF			
AUTOMATIC RACK ADVANCE						ON	NOT USED	
NORMAL OPERATION						OFF		

COIN COUNTER

	SW#1	SW#2	SW#3	SW#4	SW#5	SW#6	SW#7	SW#8
ONE WAY							NOT USED	ON
TWO WAY								OFF

Figure 3 - 7: *"Galaga* Parts and Operating Manual." The International Arcade Museum. http://www.arcade-museum.com/manuals-videogames/G/galaga1.pdf (accessed 4/14/15)

2. UPRIGHT and MINI models:
Unlock and open the rear access door.

COCTAIL TABLE model:
If you have this model, you will need to open the table top to reach the necessary terminal board. (See the appropriate opening procedure in the "MAINTENANCE AND REPAIR" section of this manual.)

3. Move the plug in the Rapid Fire P.C. Board from position "A"-RAPID, to position "B"-MANUAL.

4. To close the game, reverse the opening procedure.

5. Turn the power back on, run the game Self-Test, and play one game to make sure everything is working properly.

Figure 3. Option switch settings (Continued)

DIP SWITCH 6K

COINS PER CREDIT

		SW#1	SW#2	SW#3	SW#4	SW#5	SW#6	SW#7	SW#8
FREE PLAY		ON	ON	ON					
4 COINS	1 CREDIT	ON	ON	OFF					
3 COINS	1 CREDIT	ON	OFF	ON					
2 COINS	1 CREDIT	ON	OFF	OFF					
2 COINS	3 CREDITS	OFF	ON	ON					
1 COIN	3 CREDITS	OFF	ON	OFF					
1 COIN	2 CREDITS	OFF	OFF	ON					
1 COIN	1 CREDIT	OFF	OFF	OFF					

BONUS SHIPS AWARDED AT THE FOLLOWING POINT VALUES:

BEGAN WITH 2, 3 OR 4 FIGHTERS		**BEGAN WITH 5 FIGHTERS**		SW#1	SW#2	SW#3	SW#4	SW#5	SW#6	SW#7	SW#8
1st SHIP	20000	1st SHIP	30000								
2nd SHIP	60000	2nd SHIP	100000				ON	ON	OFF		
AND EVERY	60000	AND EVERY	100000								
1st SHIP	20000	1st SHIP	30000								
2nd SHIP	70000	2nd SHIP	120000				ON	OFF	ON		
AND EVERY	70000	AND EVERY	120000								
1st SHIP	20000	1st SHIP	30000								
2nd SHIP	80000	2nd SHIP	150000				ON	OFF	OFF		
AND EVERY	80000	AND EVERY	150000								
1st SHIP	30000	1st SHIP	30000								
2nd SHIP	100000	2nd SHIP	100000				OFF	ON	ON		
AND EVERY	100000										
1st SHIP	30000	1st SHIP	30000								
2nd SHIP	120000	2nd SHIP	120000				OFF	ON	OFF		
AND EVERY	120000										
1st SHIP	20000	1st SHIP	30000								
2nd SHIP	60000	2nd SHIP	150000				OFF	OFF	ON		
1st SHIP	30000	ONE SHIP	30000								
2nd SHIP	80000	ONLY					OFF	OFF	OFF		
NO BONUS SHIPS GIVEN WITH THIS SETTING							ON	ON	ON		

DETERMINES NUMBER OF SPACE FIGHTERS PLAYER BEGINS GAME WITH:

								SW#7	SW#8
2 SPACE FIGHTERS								ON	ON
3 SPACE FIGHTERS								ON	OFF
4 SPACE FIGHTERS								OFF	ON
5 SPACE FIGHTERS								OFF	OFF

Figure 3 - 8: "*Galaga* Parts and Operating Manual." The International Arcade Museum. http://www.arcade-museum.com/manuals-videogames/G/galaga1.pdf (accessed 4/14/15)

Buying Video Arcade Games

Mediators also affected video arcade game innovation by basing their purchase criteria on pre-existing industry norms. In the beginning video arcade games were created to be "typically quiet, compact, and discreetly packaged."[94] *Pong* was a tangible manifestation of this vision. It was relatively quiet, unflamboyant in its gameplay, and housed in an understated cabinet. The "sophisticated" design of the first several years of video arcade games was instrumental to their success, but gradually faded due to mediator market feedback. Long-standing traditions in the coin-op amusement industry indicated that novelty, spectacle, and noise were selling points because they drew attention and differentiated games with otherwise similar elements.[95] From roughly 1974 to 1978 video arcade games were disproportionately purchased by "new blood" operators willing to break from established models, and therefore avoided some market pressures from "conventional" mediators.[96] However, the consumer base of video arcade games expanded over time to encompass mediators who were "quite traditional in their outlook." [97] The priorities of newer mediators also changed as they increasingly branched out into "family fun center" arcades in which video arcade games co-existed with other, older coin-op amusement technologies. Traditional arcade designs were more important

[94] "The Markets." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[95] Karen Collins. "One-Bit Wonders: Video Game Sound before the Crash," in Mark J.P. Wolf, ed. *Before the Crash: Early Video Game History* (Detriot: Wayne State University Press, 2012), p. 121.
[96] Mediator demographics notably changed in the early 1980s with an influx of new operators eager to profit on the sudden rise in video arcade game popularity. However, by that time industry design practices had already shifted away from the "sophisticated" models exemplified by *Pong* and other early video arcade games. Ralph Lally, ed. "'The year the industry found itself:' Reviewing the coin-op year 1981," *Play Meter*, Vol. 7, No. 23, December 1981, p. 22; Lally, ed., April 1975, p. 7.
[97] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1

than sophisticated designs in this context, and gave "impetus to manufacturers to produce equipment aimed at the new and growing market."[98]

Applying pre-existing coin-op practices made video arcade games take on a "garish" presentation style that had originally been rejected by producers.[99] Many mediators believed that the social acceptability represented by sophisticated cabinets was less important than the ability to generate revenue in the usual spaces. In this context, video arcade games had to capture user interest when placed next to the bright colors, flashing lights, and noise of other coin-op amusements.[100] Producers responded to mediator demands with stylistic and technological changes. In general, cabinet artwork became increasingly colorful and elaborate. In contrast to its original plain wood cabinets, Atari distributed an industry newsletter in 1978 recognizing that artwork played "a crucial role in attracting the attention and interest of the players" and affirming a commitment to "dynamic and original designs that make Atari's games stand out in any location."[101] Video arcade games were increasingly programmed with "attract modes," or "a generally unplayable demonstration of a game that runs between play sessions" that was "specifically designed to entice passersby to part with their money."[102] Sound became more important and more intricate.[103] As explained by video game sound scholar Karen Collins, "Games in the arcades competed for the attention (and money) of players,

[98] Lally, ed., May 1975, p. 7.
[99] "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 2.
[100] Collins, in Wolf, ed., p. 121.
[101] Carol Kantor, ed. "Behind the Scenes: Atari's Artists," *Atari Coin Connection*, Vol. 2, No. 6, June 1978.
[102] Judd Ethan Ruggill and Ken S. McAllister. *Gaming Matters: Art, Science, Magic, and the Computer Game Medium* (Tuscaloosa: The University of Alabama Press, 2011), p. 70.
[103] Collins, in Wolf, ed., p. 128-129.

and sound was an important way to draw attention, differentiate the machines, and remind players of previous enjoyment."[104]

Traditional coin-op amusement practices encouraged imitation among video arcade game producers. Mediators and producers alike believed that novelty was the most important element of a successful coin-op amusement.[105] As articulated in a 1976 video arcade game technical manual, operators all vied "for essentially the same clientele" and those "running the newest and most stimulating games will inevitably come out ahead when all the quarters are counted. "[106] Lally wrote that video arcade games were appealing because they were "excitingly novel" and therefore "consistent money earners."[107] However, the willingness of mediators to purchase derivative games made clear that the novelty of each machine need not be substantive.[108] Distribution models involving exclusive licenses established during the jukebox boom of the 1950s had made superficial novelty the industry norm. Innovative technologies created by one company could only be sold by that company's distributors, creating instant demand from rival distributors with contracts to different producers. Typically these market dynamics resulted in quick imitation and repackaging with (it was hoped) just enough changes to avoid lawsuits. Based upon these practices, operators displayed a willingness to buy multiple, remarkably similar video arcade games. According to *Play Meter*, "Instead of

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[104] Collins, in Wolf, ed., p. 127.
[105] Novelty is consistently cited by both producers and mediators as a crucial determinant of financial success. See, for example, "Engineering Notebook," Steve Bristow Papers, Box 1, Folder 6, p. 60; "The Industry." Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1; Lally, October 1975, p. 41; Roger C. Sharpe. "Paradise Lost: Why players left and how to get them back," *Play Meter*, Vol. 10, No. 20, November 1984, p. 60.
[106] "Introduction." *Video Game Logic*, 1976, reprint in Steve Bristow Papers, Box 14, Folder 1.
[107] Lally, October 1975, p. 41.
[108] Pierson, November 1980, p. 37-38.

coming up with new themes and new game ideas, the video game companies have, for the most part, simply been re-hashing and embellishing the same thing that worked last year."[109] An emphasis on surface-level novelty functioned for mediators while video arcade games rode a "wave of enthusiasm" but ultimately led producers to oversaturate the market with similar games.[110]

Part Four - The Height of the Market

The 1977 *Play Meter* annual operator survey indicated that video arcade games moved into a tie for per machine weekly gross income with pinball machines ($44) and were eclipsed only by phonographs ($46). During the year mediators purchased twelve new video arcade games on average, up from the previous year and second only to pinball machines (thirteen). In 1978 pinball machines incorporated solid state electronics that enabled complex sound effects and new gameplay features.[111] As a result, the weekly gross of pinball machines ($62) topped all other coin-op amusements. Meanwhile, video arcade games had an increased weekly gross ($50) but fell to fourth in rankings, suggesting that pinball and video arcade games were competing for some of the same quarters. Pinball machines were the top earner again in 1979 ($65), though video arcade game weekly gross rose dramatically ($64). Mediators bought significantly more new pinball machines during their uptick in popularity, twenty-one on average in 1978 and nineteen in 1979. Despite the resurgence of video arcade games following the release of

[109] Pierson, November 1980, p. 44.
[110] Pierson, November 1980, p. 44.
[111] The first solid state pinball machines were released in 1976, but industry-wide adoption did not take place until 1978.

Space Invaders (1978) and *Asteroids* (1979), new video arcade game purchases actually fell from twelve on average in 1978 to nine in 1979.[112]

Video arcade games first came to dominate the coin-op amusement industry in 1980. Per machine weekly gross rose from $64 in 1979 to $102 in 1980, a fifty-nine percent increase. Pool tables ranked a distant second in weekly gross at $66. The average operator purchased twenty-two new video arcade games, more than double the 1979 rate. *Play Meter* wrote "Two out of every three operators in the United States experienced an increase in profits during 1980, an increase almost entirely attributable to the phenomenal earning ability of recent video games."[113] With the exception of pool tables, the week gross for all other coin-op amusements fell. Due to this "sudden change in the market," mediators "diverted money earmarked for other equipment type purchases to buy even more of the high-earning video games."[114] Fueled by user enthusiasm for video arcade games, coin-op industry mediators as a whole were earning an estimated $137.5 million per week, or $7.15 billion per year.[115]

The Golden Age from 1979 to 1983 was a time of expansion for mediators. Video arcade games in prime locations could earn up to $1,000 per week.[116] These well-publicized profits led to a sudden influx of video arcade game operators as would-be entrepreneurs joined the industry, which had few barriers of entry. As described by Carly Kocurek, "Video gaming was very lucrative for a number of long-term operators and

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[112] Statistics are derived from *Play Meter*'s annual operator survey in 1980, which included selected data from the 1977-1979 surveys. Ralph Lally, ed. "Play Meter Survey Results: Videos sweep to big gains in 1980," *Play Meter*, Vol. 6, No. 21, November 1980, p. 24-28.
[113] Lally, ed., November 1980, p. 24.
[114] Lally, ed., November 1980, p. 24.
[115] Lally, ed., November 1980, p. 26.
[116] Martin Jaffe. *Regulating Video Games* (Chicago: American Planning Association, 1982), p. 1.

lured others into the business as the intense media coverage made the games seem like an avenue to fast riches."[117] "Video madness" further broadened the acceptability of video arcade games and allowed them to sprout a variety of new spaces "where their ancestor, pinball, is *machine non grata*."[118] Video arcade games also multiplied in existing establishments, transforming the majority of coin-op amusement areas into decidedly video arcade game spaces.

The increased profits and popularity of video arcade games came with a new set of problems. More mediators meant less money to go around. Many became solely reliant upon the popularity of video arcade games to maintain their business.[119] The mounting "moral panic" over arcades and video arcade games led numerous local and city governments to impose fees and restrictions on video arcade games that hampered "the industry's productivity and profitability."[120] Mediators reached a new apex of influence and cultural relevance because of video arcade games, but in doing so tied themselves to the fate of a technology that was under fire.

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[117] Carly Kocurek's characterization is reinforced by an explanation of *Play Meter*'s 1981 operator survey: "The operator population had swelled to 9,000 in the U.S.A., according to *Play Meter*'s 1981 Survey findings. Of that 9,000 population, 24 percent were new to the industry and hadn't committed capital to it until after the time of the 1980 AMOA show, according to the annual survey respondents. Thus the average operator had entered since the *Space Invaders* boom came about and a large percentage went into business since *Asteroids*." Carly A. Kocurek "Coin-Drop Capitalism: Economic Lessons from the Video Game Arcade," in Wolf, ed., p. 196; Lally, ed., December 1981, p. 20

[118] Julie Salamon. "Watch Out, Earth! Invaders From Space Are Coming for You: Zap Them With a Laser Beam, It Only Costs a Quarter; Video Madness Breaks Out," *Wall Street Journal*, clipping in "Atari Almanac." Steve Bristow Papers, Box 13, Folder 8.

[119] Ralph Lally, ed. "Play Meter Survey Findings: Too many games, too many operators… too little revenue," *Play Meter*, Vol. 8, No. 22, November 1982, p. 44.

[120] Lally, ed., November 1982, p. 50, 53.

Crafting Video Arcade Game Spaces

In the early 1980s video arcade games predominated in coin-op amusement spaces. Pinball machines and other electromechanical games became secondary technologies in the industry.[121] Mediators shifted the balance of devices in general coin-op amusement arcades and public amusement centers (boardwalks, amusement parks, tourist areas, etc.) to make video arcade games a significantly larger feature than other coin-op attractions.[122] Video arcade games retreated somewhat from up-scale spaces like country clubs and hotel lobbies as they incorporated loud noises and bright colors, but made up for their losses by gaining traction in restaurants, movie theaters, and convenience stores.[123]

The growing popularity of video arcade games allowed mediators to embrace new business models. In general mediators expanded into two types of new spaces: child fun centers and video arcades (differentiated from general coin-op amusement arcades by an overwhelming reliance upon video arcade games). Child fun centers were similar to "family fun center" arcades but sought to appeal specifically to adolescents.[124] The most successful examples, such by Chuck E'Cheese and Pizza Time, paired video arcade games with animatronic attractions and child-friendly food. In contrast, video arcades made video arcade games the central (or frequently the sole) attraction of their establishments. Some followed in the footsteps of pool halls and pinball parlors, and were

[121] Lally, ed., November 1982, p. 44.
[122] "A Red-Hot Market for Video Games," Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[123] Lally, ed., December 1981, p. 20; Salamon, copy in "Atari Almanac," Steve Bristow Papers, Box 13, Folder 8.
[124] Marcus Webb. "Showbiz Pizza Place Knows Where the Coin-Op Profits Are," *RePlay*, Vol. 10, No. 11, August 1985, p. 46.

typically dark, smoky, and dominated by young males. Others attempted to create more family-friendly variants with designs that favored bright, clean spaces and positive image narratives involving play, heroism, and/or adventure.[125]

The types of video arcade game spaces that mediators designed and crafted presented consequences for how video arcade games were viewed and experienced. Some characterized the technology as an entertaining but frivolous pastime. Traditional coin-op amusement spaces in restaurants, bars, and bowling alleys treated video arcade games as side pursuits, while food and drink were the primary draws.[126] General coin-op amusement arcades, public amusement centers, and child fun centers viewed video arcades games as novel but trivial fun. They were only component parts in a system aimed at the sale of generalized coin-op entertainment.[127]

Dedicated video arcades treated video arcade gaming as a worthy pursuit and were particularly formative to the social characteristics of the technology. Some continued previous pool hall and pinball models with little alteration. Dark and often poorly supervised, they had connotations (both real and imagined) of seediness, drug use, counter culture, and organized crime (fig. 3-9). The model consistently raised public morality concerns and haunted the industry. Partly to combat this public view and partially to implement competing visions, other mediators emphasized the new and high-tech aspects of video games. Breaking from established models of '"poorly lit cubicles filled to the ceiling with cigarette smoke," they crafted interiors "filled with florescent

[125] Bill Kurtz. "Smoke-filled to space-filled: Décor changes arcades' image," *Play Meter*, Vol. 8, No. 22, November 1982, p. 122.
[126] Joyce Worley, ed. "Beefsteak Charlie goes Gobbler Route," *Arcade Express*, Vol. 1, No. 2, August 20, 1982, p. 2.
[127] Webb, August 1985, p. 47.

Figure 3 - 9: A Times Square video arcade, ca. 1983-1984. Photographer and filmmaker Hilton Ruiz, who grew up near Times Square, remembered the video arcades as a "sort of sin city" and that "once you go there, anything could go." Hilton Ruiz, as quoted in Yannick Lejacq. "How a Photographer Recovered the Seedy Glory Days of Times Square Arcades." *Kill Screen*, May 25, 2012. http://killscreendaily.com/articles/how-eight-year-old-photographer-captured-seedy-glory-days-times-square-arcades-1983/ (accessed 5/22/15)

lights and mirrored ceilings, with split-level floors and background music."[128] (fig. 3-10, fig. 3-11) Mediators developed video arcade themes intended to articulate and encourage the audience's collective identity, with science fiction predominating. They initiated and

[128] Kurtz, November 1982, p. 122.

Figure 3 - 10: A Bay Area arcade, ca. 1982-1983. Bay Area video arcades: photographs by Ira Nowinski, 1981-1982, Stanford University Special Collections, Stanford University Libraries, Stanford, CA.

fostered a communal desire to hold tournaments where video games were appropriated to a category of space-age sport.[129] Food and drink were very rarely a focus, and some establishments prohibited consumption in order to prevent damage to the games.[130] As discussed in chapter four, the devotion to video arcade games and relative lack of other

[129] Joyce Worley, ed. "*Tron* Tournament," *Arcade Express*, Vol. 1, No. 1, August 15, 1982, p. 5; Joyce Worley, ed. "*Pac-Man* Showdown in New Mexico," *Arcade Express*, Vol. 1, No. 6, October 24, 1982, p. 4; Ed Adlum. "Twin Galaxies' Masters and 'Iron Man' Tournaments Spur Players to New Records," *RePlay*, Vol. 10, No. 11, August 1985, p. 62.

[130] Bay Area video arcades: photographs by Ira Nowinski, 1981-1982, Stanford University Special Collections, Stanford University Libraries, Stanford, CA.

Figure 3 - 11: Three users at a Bay Area arcade, ca. 1982-1983. Bay Area video arcades: photographs by Ira Nowinski, 1981-1982, Stanford University Special Collections, Stanford University Libraries, Stanford, CA.

entanglements allowed these spaces to create and negotiate meanings based primarily around video gaming and gamer culture.[131]

The types of use fostered by each of these spaces were very different. Mediator choices about how and where to place video arcade games therefore influenced how play took place. Restaurants, bars, and bowling alleys were primarily for solo or small group play. Few opportunities to build a gamer community presented themselves because of the limited number of machines in a given location (usually no more than five) and the secondary status of the machines within the space. Child fun centers presented video

[131] Chapter four, "Forming Community."

gaming as supervised play for pre-teens, situating it as a child-parent bonding exercise.[132] The concentration of video arcade games in coin-op amusement arcades and public amusement centers was conducive to the formation of user communities, but presented games as frivolous consumption. In contrast to other models, dedicated arcades encouraged user communities to form around shared interests, competition, and meritocratic principles. As described in chapter four, they made video arcade games a focus of experience that allowed a devoted subculture to flourish.[133]

Public Resistance

The "moral panic" over video arcade games was a significant threat to mediators. Moral objections to coin-op amusements were not new. Mediators had a history of dealing with public resistance and negative press, and there were always a "minority of people who would put [mediators] out of business."[134] However, newfound cultural visibility made video arcade games a target in a way that mediators hadn't experienced since the crackdown on pinball in the late 1930s and early 1940s. Considerable media

[132] Webb, August 1985, p. 47.
[133] Chapter four, "Forming Community."
[134] Louis Boasberg, an influential distributor in New Orleans, addressed his fellow mediators on the topic of public resistance to coin-op amusements in 1975: "… no matter how many licenses and taxes you pay on your amusement equipment – and we are the most highly taxed in the world – there will always be a minority of people who would put you out of business. These minorities consist of: 1) Men and women looking for publicity; little people trying to be big people; 2. Do gooders who think they are going to make the world better, especially for the youngsters, by eliminating coin operated games; 3. Owners and managers of rival businesses such as theatres, movies and other people who think that game rooms, arcades, etc. hurt their own businesses; 4. Parents who cannot discipline their own children, but who think that eliminating certain things will make their children better; 5. The general press and television media, always seeking a sensation, who are ready to "expose" and pounce on the few bad aspects of our business, many times because we are not large advertiser. If someone would ask what we would advise all operators to do to combat these forces of hypocrisy, we would say always maintain friendly relations with all people. Everyone needs good public relations… You are in a legal, highly taxed business, but you have to fight for its existence." Louis Boasberg. "Sound off!" *Play Meter*, Vol. 1, No. 5, April 1975, p. 8.

attention and successful lobbying by public morality groups created a "new negative attitude" of city councils towards arcades.[135] Michael Mendelsohn of *Play Meter* warned that "if carried too far, the negative publicity could be disastrous to our growth."[136] Each mediator was individually responsible for "battling this negative tide of publicity" because "if left unchecked, the end result will be the loss of many locations due to over-regulation."[137]

Mediators tried to protect their livelihood by addressing the public via newspapers. For example, arcade operator Michael Collins of Yonkers responded to an anti-arcade editorial in the *New York Daily News* entitled "Blast those invaders" by arguing that the seediness of some arcades should not lead to blanket statements about the industry as a whole. He objected to the depiction of "the video-game industry as a sleazy, organization-controlled, den of iniquity" and wrote that it was "grossly unfair to the many legitimate businessmen" that operated and distributed video arcade games.[138] Ron Goodwiler, an operator in Wisconsin, defended video arcade games in his local paper by arguing that they trained kids to be better workers: "I think they're the mill workers of tomorrow. When they first come in they're very slow and as soon as they play [the video arcade game] for a little while, they get faster… In a few years from now you'll get better production from the same amount of people."[139] He added that playing video games kept "the kids off the street and not smoking dope" because it gave them

[135] Mendelsohn, December 1981, p. 37.
[136] Mendelsohn, December 1981, p. 37.
[137] Mendelsohn, December 1981, p. 37.
[138] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.
[139] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.

"something to do downtown."[140] After a local paper in Westchester, New York published an article calling Stella Tan's video arcade a "potential bomb" of criminal behavior, she countered with an op-ed challenging critics to "visit my video center and observe a well-run and friendly atmosphere."[141] She said her clientele consisted of "businessmen, scientists, honor students, and all kinds of decent people who enjoy the challenges of sophisticated computer-controlled machines" and benefitted from the "excellent devices for developing quick and accurate hand and eye reflexes."[142]

Play Meter took an active role in combating negative characterizations of video arcade games. It called on "local, state, and national operator programs" to "produce a positive image of operating."[143] It published a series of "PR Problems/PR Solutions" guides with suggested responses to public questions such as "Do video games create law enforcement problems?"[144] Other topics included how best to serve industry interests during TV and radio appearances, and how to "get in step" with religious groups, educators, and local authorities through careful social interactions.[145] Much of the information was reprinted from "A Community Relations Manual for the Coin-operated Amusement Games Industry" put out jointly by several trade associations within the coin-op amusement industry.[146] In one issue *Play Meter* published a full page that read

[140] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.
[141] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.
[142] "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1.
[143] Lally, ed., December 1981, p. 18.
[144] Ralph Lally, ed. "PR Problems/PR Solutions," *Play Meter*, Vol. 8, No. 20, October 1982, p. 66.
[145] Ralph Lally, ed. "PR Problems/PR Solutions," *Play Meter*, Vol. 8, No. 21, November 1982, p. 62; Ralph Lally, ed. "PR Problems/PR Solutions," *Play Meter*, Vol. 9, No. 17, September 1983, p. 58.
[146] These associations were the Amusement and Music Operators Association, the Amusement Games Manufacturers Association, and the Amusement and Vending Machine Distributors Association. Lally, ed., November 1982, p. 133.

"Attention! No Student under 18 Allowed to Play These Games during School Hours" with instructions to "cut out or reproduce; post in the arcade."[147]

Play Meter praised arcade spaces and mediator practices that contributed to "a good image of the industry" and condemned those that gave it a bad name.[148] It also publicized examples of mediators improving the industry's reputation through public outreach. When an arcade in Dayton, Ohio donated half of one's week's profits to the Montgomery County Mental Health Association, *Play Meter* wrote that the event "raised more than $5,000 for mental health and created some great public relations for video games in that city."[149] Another program instituted by the Malibu Fun Center arcade chain rewarded good grades with free tokens and was praised for generating "a lot of good will with teachers and parents, as well with students."[150]

Despite these efforts, the moral panic cut into mediator business. *Play Meter*'s operator surveys revealed that in 1981 and 1982 thirty-nine percent of mediators "were hampered by excessive governmental intrusion and undue restrictions placed on their business."[151] As described in chapter one, local governments enacted a variety of fees and restraints on video arcade games.[152] A few municipalities placed age restrictions on

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[147] Lally, ed., October 1982, p. 64.
[148] See, for example, Dawn Adorno. "Operators Debate the Pros and Cons of 'Gray Area' Games," *Play Meter*, Vol. 9, No. 17, September 1983; Valerie Cognevich. "Gray Area Games Black Industry's Image," *Play Meter*, Vol. 9, No. 17, September 1983; Valerie Cognevich. "You've Pushed Too Far! Associations Speak Out on 'Gray Area' Games," *Play Meter*, Vol. 9, No. 17, September 1983; Lally, ed., December 1981, p. 18; Mike Shaw. "Hell-Bent For Profit: 'Gray Area' Operators: 'Everybody Makes Money and Nobody Goes to Jail,'" *Play Meter*, Vol. 9, No. 17, September 1983; Ralph Lally, ed. "Baltimore Ops Fight City Hall," *Play Meter*, Vol. 9, No. 17, September 1983.
[149] Ralph Lally, ed. "Short Subjects," *Play Meter*, Vol. 8, No. 21, November 1982, p. 30.
[150] Worley, ed., August 20, 1982, p. 2.
[151] The thirty-nine percent figure was identical in both the 1981 and 1982 surveys. Lally, ed., November 1982, p. 50, 53.
[152] Chapter one, "Moral Panic."

use or banned video arcade games outright.[153] Mediators complained of "zoning hassles" and "restrictions on the number of machines allowed in a given area."[154] They reported "bans on game types" and "excessively high taxes and license fees brought on apparently by the public's misconception of the profitability of video games."[155] Anti-video arcade game legislation significantly hindered mediators by cutting into profits and reducing the potential user base of video arcade spaces.

Troubling Signs

Even as their profits soared to new heights, some mediators questioned whether a coin-op amusement industry based on video arcade games would have long-term viability. There were major concerns about market saturation, both in terms of machines and number of mediators.[156] An analysis of survey data by *Play Meter* in 1981 concluded "The large number of arcades which opened this past year tempered the increases many of us expected to see this summer, which may be a sign of things to come. Game income and used game values will drop this fall. How far they will drop is the question."[157] *Play Meter* contributor David Pierson wrote that "operators should keep themselves more attuned" to the "quick-changing nature" of the coin-op amusement business, "or else, like the Hollanders of 1634, they may find themselves with an abundance of video tulips."[158] He cautioned mediators "Do not allow yourself to get over-extended in one type of

[153] See, for example, "Atari Coin-Op Press Clippings, 1982." Steve Bristow Papers, Box 16, Folder 1; Jaffe, p. 2-3, 8; Ralph Lally ed. "Banning in Boston," *Play Meter*, Vol. 8, No. 21, November 1982, p. 17; Ralph Lally ed. "Get Out of Town," *Play Meter*, Vol. 8, No. 20, October 1982, p. 24.
[154] Lally, ed., November 1982, p. 50, 53.
[155] Lally, ed., November 1982, p. 53.
[156] Mendelsohn, December 1981, p. 36.
[157] Mendelsohn, December 1981, p. 37.
[158] Pierson, November 1980, p. 45.

equipment because, no matter how good everything is going today, one day the greater earner will be the dog. That's the nature of this business."[159]

Play Meter's 1982 state of the coin-op amusement industry report revealed looming problems. Profitability peaked in 1981. Upright video arcade games brought in an average gross of $140 per machine per week, and cocktail cabinets brought in $115. By comparison, pool tables brought in the next most earnings at $67, followed by pinball machines at $66. Most other coin-ops displayed a modest increase in revenue. But by the end of 1982 there were signs that video arcade games were declining in popularity. Though they were still bringing in money, the weekly gross for upright cabinets declined by twenty-two percent ($109 per machine per week) and cocktail cabinets declined by sixteen percent ($97 per week). Pinball machines saw a similar seventeen percent decline ($55 per week).

According to *Play Meter*, the problem was market saturation.[160] The operator population had risen to 12,000 in 1982, a thirty-three percent increase, and created "a quick over-saturation of the market."[161] Though the industry drew more revenue than ever in 1982, *Play Meter* explained that "there was a mocking disparity between total dollars generated and total profit," especially at the operator level.[162] As video arcade game producers reported record sales and profits, video arcade game mediators saw a worrisome decline in their side of the industry. The rising purchase price of video arcade games was also a considerable issue: "operators reported that in order for them to break

[159] Pierson, November 1980, p. 45.
[160] Lally, ed., November 1982, p. 43.
[161] Lally, ed., November 1982, p. 46.
[162] Lally, ed., November 1982, p. 44.

even on a video game investment, each machine had to average $117 per week for a 10.5 (month) period."[163] In 1982 video arcade games generated less than the necessary revenue to break even, and they remained "commercially viable" for only 7.3 months.[164]

Unfortunately for mediators, the coin-op amusement industry had become almost entirely dependent upon video arcade games. *Play Meter* estimated that that in 1982 1,375,000 video arcade games were in operation "on location," up from 780,000 in 1981. They accounted for seventy-seven percent of all active coin-op amusement machines and eighty-seven percent of "the industry's total gross collections." *Play Meter* summarized "In other words, with video accounting for more than $7.7 billion of the industry's total $8.9 billion gross collections, all other forms of coin-op entertainment have been relegated to an ancillary status in the industry."[165] Indeed, eight-seven and a half percent of new coin-op amusement purchases in 1982 went to the video arcade game manufacturers.[166] *Play Meter* noted that this was a stark departure from "the industry's past philosophy where operators tried to maintain a balance of equipment types to hedge against the public becoming disenchanted with one form or another of coin-op entertainment."[167] The magazine predicted (correctly) that the operator population would decrease in 1983 as the industry went through a "shakeout."[168]

Histories of video arcade games have neglected the role of coin-op amusement mediators in the 1983 North American video game industry crash. Mismanagement at

[163] Lally, ed., November 1982, p. 46.
[164] Lally, ed., November 1982, p. 46.
[165] Lally, ed., November 1982, p. 43-44, 50.
[166] Lally, ed., November 1982, p. 50.
[167] Lally, ed., November 1982, p. 44.
[168] Lally, ed., November 1982, p. 44.

Atari is typically blamed, and (as discussed in chapter two) it was probably the most important factor.[169] However, the fact is that the crash started at the mediator level before it materialized at the producer level. An overpopulation of operators saturated the market in 1982 and caused video arcade games to lose much of their profitability at the operator level. Lower profits meant that operators had less money to make purchases, leaving distributors with a sudden glut of machines and not enough buyers. Some operators defaulted on leasing or rental agreements and thereby further increased distributor inventories. Distributors with overstocked warehouses and declining incomes bought fewer new machines and affected producer profits. Mediators also contributed to the crash by basing purchasing criteria on models that accepted imitation and diluted overall quality. Models that prioritized noise and spectacle combined with a willingness by some mediators to run sleazy establishments and exacerbated the moral panic over video arcade games. The inability of mediators to create a united front and placate public concerns left the industry vulnerable to restrictive legislation.[170] None of these circumstances was enough in and of itself to bring down the American video arcade game industry, but all contributed to its decline.

Part Five - Retrenchment

1983 was a bad year for coin-op amusement industry mediators. Seventy-two percent reported a decrease in net profits. *Play Meter* placed the blame on the decline of video arcade games: "Like an inconstant lover, the video game spread heartache through

[169] Chapter two, "The Decline of Video Arcade Games;" Cohen, p. 132; Kent, p. 237-239.
[170] Ed Adlum. "From the Publisher," *Replay*, Vol. 11, No. 1, October 1985, p. 8.

the coin-op amusement industry…"[171] The average per machine weekly gross fell to $70, half of the peak earnings ($140) of 1981. The mediator consensus was that producers had created too many games and that most were of poor, derivative quality.[172] There was a "lack of general public interest" in video arcade games, and "home games hacked away at over-all industry earnings, leaving the national gross take for 1983 at $6.4 billion, off a whopping 28 percent, or $2.5 billion short, of the $8.9 billion Americans put into coin-operated amusements in 1982."[173] $2.3 billion of that shortage was a result of reduced video arcade game revenues. Other types of coin-op amusements, especially pinball machines, were also down. Mediators sought ways to stay in business as fortunes fell. Industry veterans survived by adhering to the traditional coin-op amusement industry models that pre-dated video arcade games.

Video Arcade Game Spaces and the Crash

As the crash progressed through the mid-1980s some video arcade game spaces tended to succeed while others failed. Public amusement centers, child amusement centers, and generalized coin-op amusement arcades deemphasized video arcade games and diversified their entertainment options.[174] Some were able to stay in business, although many went under. Restaurants, bowling alleys, and other spaces where video arcade games were auxiliary continued to be viable locations because the technology

[171] Ralph Lally, ed. "Operator's Fortunes Fall with Video Earnings," *Play Meter*, Vol. 9, No. 20, November 1983, p. 42.
[172] Ralph Lally, ed. "Operators Address Manufacturers, Distributors," *Play Meter*, Vol. 9, No. 20, November 1983, p. 63.
[173] Lally, ed., November 1983, p. 42.
[174] Marcus Webb. "Malibu Grand Prix Has Found a new 'Formula': Diversity," *RePlay*, Vol. 10, No. 11, August 1985, p. 55; Webb, August 1985, p. 46.

worked in support of other draws. Persuading customers to purchase food and drink was the common aim, and video arcade games only needed to attract a limited number of customers to have economic utility. Mediators working these areas had a greater chance of staying in business due to low overhead costs. However, because video arcade games were side attractions in these spaces they rarely fostered strong user communities and didn't generate the cash flow required to keep the industry vibrant.[175]

Video arcades declined in the America. Between 1983 and 1984 "the arcades that once flourished through the United States" took a "beating."[176] In twelve months the number of arcades dropped by nearly a quarter from 25,092 to 19,565. The majority of closures were video arcades that went under because their inventories were not diversified enough to weather a crash. As video arcades waned, video game culture transitioned from community play in public spaces to solo or small group play based around home consoles.[177]

Many video arcade spaces went out of business due to pressure from local governments, news media, and public morality groups. The image and regulatory problems facing mediators worsened during the crash. Between 1983 and 1984 the number of mediators who paid special video arcade game taxes rose from thirty-nine percent to forty-eight percent, and overall rates of taxation went up considerably. *Play Meter* reported

[175] Many brick and mortar locations never pushed to upgrade games because older models kept producing just enough to encourage a continued presence and justify basic maintenance. These continue to exist as historic spaces of video arcade game culture. Raiford Guins. *Game After: A Cultural Study of Video Game Afterlife* (Cambridge: MIT Press, 2014).
[176] Ralph Lally, ed. "1984 – The Year of the Crunch," *Play Meter*, Vol. 10, No. 20, November 1984, p. 38.
[177] Chapter four, "From Arcades to Homes."

> The state, county, and city license fees on video games have nearly doubled since last year. License fees on other coin-op equipment have increased (except for the city license fee for pool tables) but not as drastically as video fees. The average state license fee on video games is now $100, up from $41 in 1983. The average city license fee is $80, up from $34 in 1983, and the average county license fee is now $40, up from $26 in 1983. It is ironic that license fees escalated as collections dropped.[178]

As revenues declined, fewer and fewer mediators "chose to take up the fight against oppressive legislation."[179] Of those who mounted resistance, fifty-seven percent were successful in 1983 and forty-four percent in 1984. *Play Meter* noted that meant in 1984 "56 percent who did fight, lost the battle, and in some cases, their business as well."[180]

Back to Basics

The economic situation worsened for mediators in 1984. Coin-op amusement industry earnings fell to $4.5 billion, far lower than the $5.9 billion in 1979. The operator population declined to 9,000, down from 12,000 in 1982. The average weekly gross for video arcade games fell to $53, the lowest level since 1978 ($50) and a decline of twenty-four percent from 1983. Due to lagging income, operators purchased only 260,324 new machines, down from 363,752 in 1983 and 640,000 in 1982. Many mediators left the industry voluntarily or went out of business. Most were newcomers that had focused on

[178] Lally, ed., November 1984, p. 43.
[179] Lally, ed., November 1984, p. 43.
[180] Lally, ed., November 1984, p. 41.

video arcade games. In 1983, sixty-one percent of operators had been in business less than three years. In 1984 only thirty-four percent of operators fell into that category.[181]

For a moment in time, it looked like video arcade games might disappear from the American cultural landscape. The number and profitability of video arcade spaces had declined dramatically and showed no signs of recovery. Atari was out of business and the Atari Video Computer System (VCS) had failed. According to *Play Meter* even computer games were in decline. Long-time contributor Roger Sharpe wrote "Home video game systems are all but dead. Personal computers, which also arrived on the heels of the coin-op explosion, have recently fallen in favor, settling into a more realistic growth curve where entertainment is now only part of a package that includes word processing, education, personal finance, and other business applications."[182]

The mediators that remained after the crash tended to be industry veterans.[183] Previous booms and busts had taught long-time mediators to be cautious. David Pierson wrote to the industry in 1980 "Operators cannot afford to neglect the rest of the amusement equipment needs and pour everything they have into an all-consuming passion for videos."[184] He reminded mediators "this is a business of cycles, of highs and lows, and so it's important the operators be prepared to swing from one [coin-op amusement technology] to another."[185] Pierson's advice was aimed at "new blood" mediators because "industry veterans" knew better than to overextend themselves on a

[181] Lally, ed., November 1984, p. 37.
[182] Ralph Lally, ed. "Distributors and Operators Adapt to a Changing Market," *Play Meter*, Vol. 10, No. 10, June 1984, p. 27; Sharpe, November 1984, p. 60.
[183] Those Mediators still in business near the end of 1984 had an average of ten-years of coin-op industry experience. Lally, ed., November 1984, p. 37.
[184] Pierson, November 1980, p. 45.
[185] Pierson, November 1980, p. 45.

single type of technology. They had experienced the "King *Pong*" boom of the early 1970s and were "attuned to" the "quick-changing nature" of the coin-op amusement business.[186]

After the 1983 crash mediators purchased far fewer video arcade games. Most diversified their inventories with "considerably more non-video, electromechanical machines."[187] By 1984 mediators preferred to shuffle existing video arcade games around several locations rather than buy new titles, and sales of the technology fell to 168,508 units, a seventy percent decline when compared to 1982.[188] *Play Meter* described "Operators made do with dramatically depressed earnings from their games in 1983, staying alive by drastically cutting new equipment purchases, preferring to maneuver old hits from location to location."[189] If a video arcade game broke, mediators were four times as likely to replace it with a used game rather than new one.[190] During the peak of video arcade game popularity in 1981, sixty percent of all video arcade games on location had been purchased in the past year. In 1984, only fifteen percent were new.[191] *Play Meter* advised that operators invest in stable, traditional coin-op amusements rather than video arcade games: "those operators who firmly entrench themselves in their phonograph and pool table locations will be safe, no matter what happens. Those who don't are in for trouble in 1985."[192]

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[186] Pierson, November 1980, p. 45.
[187] Lally, ed., November 1984, p. 37.
[188] Lally, ed., November 1984, p. 39.
[189] Ralph Lally, ed. "Operator's Fortunes Fall with Video Earnings," *Play Meter*, Vol. 9, No. 20, November 1983, p. 42.
[190] Lally, ed., November 1983, p. 51.See also Ralph Lally, ed. "Operators Plan to Buy more Stables, Not Videos," *Play Meter*, Vol. 10, No. 20, November 1984, p. 53.
[191] Lally, ed., November 1984, p. 39.
[192] Ralph Lally, ed. "Outlook for 1985," *Play Meter*, Vol. 10, No. 20, November 1984, p. 45.

When mediators retrenched into traditional business models and adopted conservative purchasing practices, the market for video arcade games shrank. Floundering sales motivated producers to step up previous efforts to transition away from the coin-op amusement industry and towards the home electronics industry. With the North American release of the Nintendo Entertainment System in 1985 and the Sega Master System in 1986, American gaming changed to focus almost entirely on home gaming, ushering in a new paradigm of innovation, development, and experience. In doing so, it largely cut coin-op mediators out of the video game business.

Chapter Four - Users

This chapter provides an account of users, defined as individuals who played video arcade games and patronized video arcade game spaces. In recent years historians of technology have increasingly valued the user perspective and have found that users influence technology in myriad ways, particularly its significances and meanings.[1] In the case of video arcade games, users were instrumental in determining which games succeeded in the marketplace, and devoted users created a vibrant subculture that affected the social aspects of video arcade game experience.[2] I investigate user perspectives to illustrate their role in constituting the economics and culture of video arcade games. Users interacted with video arcade games in a negotiation with producers (actors that undertook and/or oversaw the creation and production of video arcade games) and mediators (actors that purchased, distributed, and operated video arcade games), in some ways that were complementary and in others that were contradictory.

Part One - Distilling the User Perspective

I explore user perspectives through examining first-hand accounts, fan publications, and media reports. *Electronic Games*, first published in December of 1981, and *Arcade Express*, first published in August of 1982, were the first two video game

[1] See, for example, Regina Lee Blaszczyk. *Imagining Consumers: Design and Innovation from Wedgewood to Corning* (Baltimore: Johns Hopkins University Press, 2000); Kristen Haring. *Ham Radio's Technical Culture* (Cambridge: MIT Press, 2007); Ronald Kline. *Consumers in the Country: Technology and Social Change in Rural America* (Baltimore: Johns Hopkins University Press, 2000); Nelly Oudshoorn and Trevor Pinch, eds. *How Users Matter: The Co-Construction of Users and Technology* (Cambridge: MIT Press, 2005); David Suisman. *Selling Sounds: The Commercial Revolution in American Music* (Cambridge: Harvard University Press, 2009).

[2] The term "gamer" commonly appears in fan publications but was not a universal descriptor. For example, *Arcade Express* used "arcader" as often as "gamer." Nonetheless, I have adopted "gamer" for the sake of clarity. Joyce Worley, ed. *Arcade Express*, Vol. 1, No. 2, August 20, 1982, p. 4, 6.

periodicals written by users and intended for users, and feature important insights into video arcade game experiences.[3] Arnie Katz, a co-founder and editor of *Electronic Games*, explained in its inaugural issue

> What kind of magazine will *Electronic Games* be? For openers, this publication is written by actual gamers for actual gamers. You'll never see so-called "reviews" written directly from manufacturers' press releases by know-nothing writers in these pages. That's a promise. Everyone on our staff, from co-founder and executive editor Bill Kunkel to staffers like Frank Tetro and Joyce Worley, are nuts about these games.[4]

Various "strategy guides," or books advising users how to improve their video arcade game scores, written by "strategists," or users that analyzed video arcade games and developed approaches to generate high-scores (automatically generated electronic lists of the top performers on a given machine). Strategists were accomplished players active in user communities, and their guides often featured commentary on user culture and the dynamics of play. Strategists were accomplished players Additional first-hand user accounts in print media provide information on how video arcade games were used, who was using them, and what significance that use had. The combined data set describes major aspects of the user perspective, including the impetus for play, mechanisms of community formation, and conflicts with other groups of actors.

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[3] It should be noted that *Arcade Express* and *Electronic Games* were video game rather than video arcade game publications, and regularly featured stories on home as well as arcade gaming. There were no user publications dedicated entirely to video arcade games. Bill Kunkel, one of the co-founders of *Electronic Games*, recalled that publishers were reluctant to focus on the technology: "The arcades, of course, were full of games, but nobody seemed to believe that coin-op gamers could or would read. Besides, *RePlay* and *Play Meter* were trade magazines already covering the arcade world in great detail." Bill Kunkel. *Confessions of the Game Doctor* (Springfield, NJ: Rolenta Press, 2005), p. 12-13.

[4] Frank Laney Jr. "Switch On," *Electronic Games*, Vol. 1, No. 1, Winter 1981, p. 6. Written by Arnie Katz under a pseudonym.

There are some limitations to the available user source material. Despite the large number of users, very few documented their experiences before the 1980s. According to Bill Kunkel, a co-founder, editor, and writer of *Electronic Games*, the prevailing wisdom was that "nobody wanted to read about *Pong* machines" because there was little to say "about a bunch of bleeps and bloops."[5] My treatment of video arcade game users is therefore predominately focused on the "Golden Age" of video arcade games from 1979 to 1983.

The user experience was ephemeral. The vast majority of users left no record of their encounters outside of the coins they deposited. The sheer number of actors involved and the limited number of accounts make the user experience difficult to encapsulate. Due to the available materials, publishing users (critics, commentators, strategists, etc.) serve as a stand in for the otherwise silent group. Publishing users were elite actors with the ability, connections, and/or resources to produce written accounts, and therefore indirect representatives of users as a whole. They acted as mouthpieces for user communities, and voiced priorities, values, and concerns that, in a dialogic feedback loop, had a role in shaping user outlooks. I therefore utilize their accounts as proxies for user experiences otherwise lost to history.

User demographics were varied and diverse, but during the Golden Age the majority of players were young men in their teens.[6] The profile of the average user had

[5] Kunkel, p. 12.

[6] Charles Beamer, a high-school teacher and free-lance author, described user demographics in 1982: "Few generalizations can be applied to the people you find in video game centers and arcades. They tend to be young, and they tend to be male. There are fewer girls and still fewer women who play, and there are far more young people than adults. The adults who play tend to wait until 'the kids clear out' before taking their turn. After all, it's sort of embarrassing either to stand in line waiting to play a machine behind a

changed since the early years of video arcade games. In the early 1970s most users were college students, a traditional audience for coin-op amusements.[7] *Pong* and its variants were initially placed in bars and student unions populated by young adults.[8] The average user actually got older in the mid-1970s when video arcade games spread to cocktail lounges, country clubs, and hotels.[9] Game design favored male themes and points of view (as described in chapter two), but at first users were not presumed to be predominantly male.[10] However, over time user demographics slowly skewed younger and more masculine, until by the early 1980s the audience for video arcade games was "mostly young men."[11] For reasons discussed below, the young male majority formed the vast majority of publishing users and community leaders. Gamer culture reflected the

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bunch of kids or to play poorly and have some ten-year-old easily triple your score!" Charles Beamer. *Video Fever* (Nashville: Thomas Nelson Publishers, 1982), p. 15-16.

[7] Ralph Lally wrote in *Play Meter* "During the industry's pre-video years, the meat of an operator's route was in bars, truck stops, taverns, and restaurants. His target audience consisted of blue collar workers and college students." According to Nolan Bushnell, the computer technology in video arcade games intimidated blue collar workers, but not college students. Not coincidentally, most of Atari's first video arcade games were placed in student unions and college bars. Nolan Bushnell, as quoted in Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001), p. 34; Ralph Lally, ed. "The Industry Must Recapture Players' Interest," *Play Meter*, Vol. 9, No. 20, November 1983, p. 6.

[8] "Atari New Product Forecast." Atari, Inc. Business Plans, 1974-1975, Stanford University Special Collections, Stanford University Libraries, Stanford, CA, 1974-1975, Box 1, Folder 1; Lally, ed., November 1983, p. 6.

[9] Gene Beley and Sonny Albarado. "Cocktails, anyone? The boob tube pays off," *Play Meter*, Vol. 1, No. 5, April 1975, p. 26.

[10] Chapter two, "Who Video Games Were For;" Marty Goldberg and Curt Vendel. *Atari, Inc.: Business is Fun* (Carmel: Syzygy Company Press, 2012), p. 151.

[11] The prevalence of young male users was a frequent topic for discussion in user publications. See, for example, Len Albin. *Secrets of the Video Game Super Stars* (New York: Avon Books, 1982), p. 3; Steve Bloom. *Video Invaders* (New York: Arco Publishing, Inc., 1982), p. 143-144; Arnie Katz, as quoted in Steve Fulton. "Electronic Games: the Arnie Katz Interview," *Gamasutra*, December 28, 2009. http://www.gamasutra.com/view/feature/132614/electronic_games_the_arnie_katz_.php?page=1 (accessed November 6, 2012); Craig Kubey. *The Winners' Book of Video Games* (New York: Warner Books, 1982), p. 4; Michael Rubin, ed. *Defending the Galaxy: The Complete Handbook of Videogaming* (Gainesville: Triad Publishing Company, 1982), p. 127. See also chapter two, "Who Video Games Were For," chapter three, "Crafting Video Arcade Game Spaces."

viewpoints and priorities of the majority demographic, even if actual users were more diverse.

Part Two - Users and the Market

Users influenced video arcade game production and placement through their power as end consumers. Games succeeded in the marketplace if they sufficiently generated user interest and met user priorities, and failed if they did not. User market feedback was usually indirect, noticed first by mediators and then passed on to producers through video arcade game purchasing practices, but producers did test most games on location to gauge user interest before making them available for sale.[12] Games that tested poorly rarely saw production. Larger operators and distributors also maintained test locations to double check the local viability of given video arcade games.[13] Users were therefore in negotiations with producers and mediators over the technological characteristics and future development of video arcade games.

Reasons for Play

Especially at first, users were attracted to the novelty of video arcade games. *Electronic Games* attributed the success of *Pong* (1972) in part to its "marvelous novelty," and both producers and mediators consistently cited novelty as a crucial factor in generating initial interest.[14] "Revolutionary" games like *Tron* (1982), which featured

[12] Tim Skelly. "The Rise and Fall of Cinematronics," in Mark J.P. Wolf, ed. *B*efore *the Crash: Early Video Game History* (Detroit: Wayne State University Press, 2012), p. 161.
[13] Bill Kurtz. "Test locations expect risks," *Play Meter*, Vol. 9, No. 17, September 1983, p. 59.
[14] See Arnie Katz, ed. "The History of Videogames," *Electronic Games*, Vol. 1, No. 2, March 1982, p. 21. See also, for example: "Engineering Notebook," Steve Bristow Papers, Stanford University Special

"a quartet of totally different games in an overall adventure contest," were popular because they included new gameplay mechanics and/or themes that made play interesting.[15] Unoriginal attempts such as *Zookeeper* (1982) were comparative failures because they lacked "originality of theme," featured tired mechanics, and joined a crowded field of "too many coin-ops" that "fit a similar description."[16]

Despite a user preference for novelty, producers hoped to profit by releasing derivative video arcade games.[17] Genuine innovation typically took significant time and money, and in the short term profits could be had by rehashing old games. Mediators often based their purchases on superficial novelty typical to other varieties of coin-op amusements and therefore frequently bought unoriginal designs.[18] Imitative games rarely caught on with users, but a mediator willingness to buy them disrupted the chain of market feedback. Novelty was still a key component of the most successful games, but from a producer perspective the difference in profits between a genuinely novel game and a superficially novel game does not appear to have been great enough to necessitate originality.

Users appreciated the ascending challenge of video arcade games.[19] Unlike other games and most coin-op amusements, video arcade games responded to player skill. The

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Collections, Stanford University Libraries, Stanford, CA Box 1, Folder 6, p. 60; Ralph Lally, ed. "Video converters welcome," *Play Meter*, Vol. 1, No. 5, April 1975, p. 7; Skelly, p. 164-165.

[15] Bill Kunkel. "Insert Coin Here," *Electronic Games*, Vol. 1, No. 9, November 1982, p. 66.

[16] Tracie Forman. "Insert Coin Here," *Electronic Games*, Vol. 2, No. 8, October 1983, p. 110-111.

[17] See chapter two, "Imitation as Common Practice."

[18] See chapter three, "Buying Video Arcade Games."

[19] Users cited physical as well as mental challenge as important draws. Ron Dubren described: "Video games appeal to us because they challenge both our bodies and minds. In addition to "physical fitness," a good video game calls for "mental fitness." Without it, you'll never master a video game." Ron Dubren. *The Video Master's Guide to Centipede* (New York: Bantam Books, 1982), p. 3. See also Ken Uston.

"flexible nature of the digital computer" set video arcade games "apart from all other games" because they could be programmed to be "easy to begin with" and "progressively more difficult" the longer a play session lasted.[20] Challenge kept games interesting and provided motivation for play. Strategist Ron Dubren explained "With each quarter, you see that it keeps getting a little more challenging and that you would like to get a little better at it."[21] A good video arcade game "never stops challenging you. It will tire you out, even exhaust you, but you'll never find it in the least bit boring. That's the best payoff for your time, money, and energy."[22] Not coincidentally, ascending challenge also met mediator priorities because, outside of generating user interest, it set practical limits on the amount of time the average user could play on a single payment. It therefore became a fundamental aesthetic of video arcade games due to combined market feedback.

Video arcade games were carefully calibrated by producers to provide a sense of accomplishment that rewarded users for skillful play.[23] The inclusion of "levels" or "stages" (plateaus of difficulty typically punctuated by a climactic challenge or event) and scoring mechanisms gave users something to achieve. Users gained skill with repeated play and learned to "stay alive long enough to feel proud, not humiliated, and encouraged, not discouraged."[24] Scoring points provided a secondary goal (beyond

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Score! Beating the Top 16 Video Games (New York: New American Library, 1982), p. 8; Joyce Worley, ed. "The Hostseat: Reviews of New Products," *Arcade Express*, Vol. 1, No. 2, August 20, 1982, p. 6.
[20] Geoffrey R. Loftus and Elizabeth F. Loftus. *Mind at Play: The Psychology of Video Games* (New York: Basic Books, 1983), p. 21. See also Albin, p. 11.
[21] Dubren, p. 2.
[22] Dubren, p. 3.
[23] "A Red-Hot Market for Video Games." *Business Week*, November 10, 1973. Atari, Inc. Business Plans, 1974-1975. Box 1, Folder 1.
[24] Dubren, p. 2.

playing for as long as possible for as little cost as possible) and proof of accomplishment.[25] As strategist Tom Hirschfield described, "The Player always has an objective: scoring points."[26]

The psychological draw of tangible, achievable success earned through talent, skill, and strategy was considerable. Craig Kubey, a strategist, critic, and commentator, described video games as "a pleasant and effective form of recreation for the player living amid the complexities and disappointments of life in the world of the 1980s."[27] Though "in the other areas of his life the player may feel a lack of ability to affect his destiny," in video games "surely for a moment and sometimes for as long as he plays, he has a certain amount of control" and the capacity to succeed.[28] Mark Baker, an avid video arcade game user and humorist, wrote that an early warning sign of "videocy" (a satirical term describing users as seen by anti-video game activists) was a "vivid imagination: lives in a dream world rather than facing the ugly reality of middle-class existence in America today."[29] User Len Albin similarly described the arcade as a place where "there's no yammering about the GNP price-deflator or the importance of Turkey to the NATO alliance."[30] For some users, video arcade games provided rewards often denied during the hard economic times and "crisis of the American spirit" that described the

[25] Carly A. Kocurek. "Coin-Drop Capitalism: Economic Lessons from the Video Game Arcade," in Wolf, ed., p. 203.
[26] Tom Hirschfeld. *How to Master the Video Games* (New York: Bantam Books, 1981), p. 1.
[27] Kubey, p. xvii.
[28] Kubey, p. xvii.
[29] Mark Baker. *I Hate Videots: Today the Arcade, Tomorrow the World* (New York: Simon and Schuster, 1982), p. 34.
[30] Albin, p. 4

early 1980s.[31] For others, especially younger users, video arcade game achievement was a simple means to feel good. As described by a sixteen-year old quoted in *Blip*, she played *Dig Dug* (1982) because "it's the only game in which I can get my initials on the high-score board."[32]

At least during the Golden Age, many users enjoyed the audio and visual spectacle of video arcade games.[33] For example, Kunkel praised *Robotron: 2084* (1982) for its "audio and visual effects that virtually sunburn the eyeballs and wiggle the ears of arcaders everywhere."[34] Users placed a premium on immersive audiovisual experiences as a break from the drudgery and concerns of daily life.[35] Albin enjoyed video arcades in part because "the sound of all the machines roaring in unison" felt "something like attending a rock concert."[36] The "noise level of the arcades" created a "unique environment" removed from "the normal world of junk mail" and "report cards."[37] At times spectacle could be more important than gameplay.[38] Laserdisc video arcade games such as *Dragon's Lair* (1983) and *Space Ace* (1984) were comparatively repetitive and

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[31] Jimmy Carter, July 15, 1979. http://www.pbs.org/wgbh/americanexperience/features/primary-resources/carter-crisis/ (accessed 5/21/15)
[32] Joe Claro, ed. "*Dig Dug*," *Blip*, Vol. 1, No. 1, February 1983, p. 19.
[33] Due to a paucity of accounts it's unclear how much users appreciated the relatively quiet and understated design of many early video arcade games. Producer and mediator accounts, as well as market data, suggest that early aesthetics characterized video arcade games as sophisticated computer technologies (and therefore made them acceptable in locations otherwise closed to coin-op technologies), but say little about whether they were preferred by users over the gaudier designs of other coin-op amusements. Chapter two, "Perceptions of Early Video Arcade Games," chapter three, "Initial Mediator Responses."
[34] Bill Kunkel. "Insert Coin Here," *Electronic Games*, Vol. 1, No. 7, September 1982, p. 58.
[35] Karen Collins. *Game Sound: An Introduction to the History, Theory, and Practice of Video Game Music and Sound Design* (Cambridge: MIT Press, 2008), p. 9, 132.
[36] Albin, p. 4.
[37] Albin, p. 4.
[38] See, for example, Arnie Katz ed. "1984 Arcade Awards Contenders," *Electronic Games*, Vol. 2, No. 7, September 1983, p. 40.

allowed for limited player control due to technological constraints.[39] Nonetheless, they were (at least at first) very popular with users. Tim Skelly, a developer at laserdisc video arcade game pioneer Cinematronics, wrote that users found the games "intoxicating."[40] He wrote "gameplay be damned, players were finally able to play a movie."[41] An emphasis on audiovisual spectacle was consistent with mediator priorities, and market feedback from both categories of actors contributed to its adoption as a core aesthetic of the medium.[42]

Escapism pervaded video arcade game use. Play was a means of temporary release "from the mundane world."[43] In *Robotron: 2084* the player became "a lone space knight" on a mission to "rescue the remaining humans" on a surface of a "ravaged planet."[44] In *Turbo* (1981) he or she was a race car driver. In his review, Kunkel described *Turbo*'s gameplay in terms that demonstrate the ability of video arcade games to draw players into an experience:

> Gamers control on-screen formula racers and roar over an eye-popping array of terrain. One second, the driver is moving over an ordinary, tree-lined highway, with beautiful mountains visible in the distance. Then the city looms ahead. Moments later, the car is streaking down urban streets. Night falls and the street lights on either side of the road flare into life. Suddenly, the road becomes increasingly hilly. Cars moving toward the gamer rise and

[39] User control was limited because laserdisc games featured a series of linked and contingent animations. The memory requirements of animated scenes meant that only a limited number could appear in a given game. A player's actions determined which animation would play, but could not act within a given animation.
[40] Skelly, p. 163.
[41] Skelly, p. 163.
[42] Chapter three, "Buying Video Arcade Games."
[43] Frank Laney Jr. "Switch On," *Electronic Games*, Vol. 1, No. 2, March 1982, p. 6. Written by Arnie Katz under a pseudonym.
[44] Bill Kunkel. "Insert Coin Here," *Electronic Games*, Vol. 1, No. 10, December 1982, p. 65.

> fall from view as they climb and descend the mountainous geography. Players are then startled to find themselves in tunnels, the luminous lane-markers and scant underground lighting serving as the only guideposts.[45]

As opposed to passive media, the participation inherent to video arcade games allowed for a unique, active experience. Players could escape, at least abstractly, by actively becoming someone or something else. Video arcade games also presented a reality that was refreshingly "simpler and more easily comprehended" than the real world.[46] Escapism was an instance where producer, mediator, and user priorities coincided. The need for escape generated revenue, and ideally gave some users a sense of "peace and calm."[47]

The Economy of the Arcade

Users and mediators were diametrically opposed in the economy of the arcade. Users fundamentally wished to play as long as possible for as little money as possible. Mediators, on the other hand, needed players to fail frequently and be forced to insert coins. These differing priorities created tensions, and users sometimes viewed mediators as adversaries. Tim McVey, a gamer famed for his high-scores, was kicked out of arcades several times "by arcade employees" ordered "to force marathoning players away from the machines they were monopolizing."[48] Michael Blanchant, a video game strategist,

[45] Bill Kunkel. "Insert Coin Here," *Electronic Games*, Vol. 1, No. 4, June 1982, p. 56.
[46] Laney Jr., March 1982, p. 6. Written by Arnie Katz under a pseudonym.
[47] Laney Jr., March 1982, p. 6. Written by Arnie Katz under a pseudonym.
[48] Kocurek, p. 203.

warned users to "beware" of mediator "corner cutting," or else "you're probably not getting your money's worth."[49]

Unfortunately for users, video arcade game design favored mediators. As the direct buyers of video arcade games, mediators stood above users in the chain of market feedback. It was therefore in the best interests of producers to cater to mediator needs above user needs. Games were calibrated to require users to insert quarters roughly every ninety seconds in specific adherence to mediator needs.[50] Cabinet architecture that appealed to users but not mediators, such as larger sit-down models, were rarely made and even more rarely successful.[51] For example, Bally/Midway's *Disks of Tron*, which featured a large and enclosed cabinet, had user appeal. Tracie Forman's review in *Electronic Games* praised the "entirely new cabinet" for its ability to "help gamers feel even closer to the on-screen action."[52] She described "Players enter a dimly-lit booth complete with cut-out sides, carpeted back for easy leaning, stereo sound effects, and large energy disk on the floor."[53] Forman wrote that the game was "clearly a winner."[54] However, the large "environmental model" was not particularly successful because it took up significant floor space, reportedly weighted around 700 pounds, and was extremely difficult for mediators to move. Producers built control options into the

[49] Michael Blanchet. *How to Beat the Video Games* (New York: Simon & Schuster, 1982), p. 8; Laney Jr., March 1982, p. 9. Written by Arnie Katz under a pseudonym.
[50] As previously stated in Chapter one, "Moving Away from Video Arcade Games," users had to lose frequently in order for mediators to generate revenue. As described by game designer Pat Ransil, "The arcade game has to be designed to play for only ninety seconds, at least as far as the beginning player is concerned. At that point, the player 'loses,' and another quarter has to be inserted." George Sullivan. "Screen Magic," *Blip*, Vol. 1, No. 6, July 1983, p. 4.
[51] "Engineering Notebook," Steve Bristow Papers, Box 1, Folder 6, p. 61.
[52] Tracie Forman. "Insert Coin Here," *Electronic Games*, Vol. 2, No. 10, December 1983, p. 106.
[53] Forman, December 1983, p. 106.
[54] Forman, December 1983, p. 106.

internal hardware of video arcade games that allowed mediators to modify software parameters in order to extract maximum profit from users.[55] In instances when mediator and user desires conflicted, mediator desires took priority.

Users objected to mediator control options. It was widely known among user authors that mediators could alter game play parameters, and it can be assumed that a significant portion of the user community were aware of the possibility.[56] Albin called mediator control options "quite devious" and complained that they "change the rules of the game."[57] Hirschfeld wrote that they only existed "to increase revenue by forcing the player's turn to end more quickly."[58] *Arcade Express* published an "Electronic Gamers Bill of Rights" that included a demand that "every coin-operated electronic game in a commercial amusement center should be exactly as shipped by the manufacturer" and that any options that "distort the original play action and raise the odds against the player should not be used."[59] Users were advised to be attentive to unusual software behavior, and careful gamers developed techniques to spot modified machines. *Pac-Man* (1980) users, for example, found that they could determine the internal speed settings on a given

[55] See Chapter three, "Controlling Video Arcade Games."
[56] It is unclear how large of percentage, but it can be reasonably assumed that anyone who read a strategy guide or subscribed to a user publication was aware of mediator control options. For example, *The Complete Video Warrior* concluded its introduction by describing "Finally, you need to know that the owners of the machines you play on can change the games. They can make them easier or more difficult by changing the speed of the machine or altering the levels where you received bonuses. So don't assume that if you can excel on one machine you will do as well on another. Be prepared for the unexpected." Major Mayhem. *The Complete Video Warrior: How to Beat the Video Games* (New York: Golden Press, 1982), p. 2.
[57] Albin, p. 180.
[58] Hirschfeld, p. ii.
[59] There may have also been an implied competition aspect to this statement, as uniformity of play was necessary to give high-scores meaning. However, this was not explicitly stated. Worley, August 20, 1982, p. 8.

machine by carefully watching the attract mode (the demonstration of gameplay which ran when the machine was left unused for a certain period of time).[60]

Users sought to overcome mediator control by acquiring the requisite skill level to play for hours on a single payment.[61] However, the economy of the arcade favored mediators because proficiency could only be gained through significant initial investment. In her analysis of arcade capitalism, Carly Kocurek explains that the only way for an individual user to surmount the arcade system of money extraction was to play by that system's rules: "The impulse to beat the house may have put players at odds with machine operators' perception of the games' economic purpose, but they can beat the house in this way only by becoming exceptional gamers – usually through hours of play, many of which would have occurred before they became skilled at gaming."[62] The idea that skilled users could prevail over the system was only an appealing myth. Both the initial investment and the expression of the myth are expressed by Len Albin: "Here and there, in small towns and large cities, there are players who refuse to be beaten by these machines. At first the games gobble big quantities of quarters. But after a while the balance of power changes and the serious player develops more of a meaningful relationship with that video game. Eventually he can stroll into an arcade, find his favorite machine, and *totally humiliate* it."[63]

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[60] The region of the screen where Pac-Man was "eaten" indicated whether the game was set to slow, normal, fast, or had been modified by a kit. Jim Sykora and John Birkner. *The Video Master's Guide to* Pac-Man (New York: Bantam Books, 1982), p. 6. See also Judd Ethan Ruggill and Ken S. McAllister. *Gaming Matters: Art, Science, Magic, and the Computer Game Medium* (Tuscaloosa: The University of Alabama Press, 2011), p. 70.
[61] Kocurek, p. 204.
[62] Kocurek, p. 203-204.
[63] Albin, p. 17. Original emphasis.

Despite these conflicts, user, mediator, and producer priorities did sometimes complement each other. Video arcade game high-score mechanics are an example. Producers included high-scores in their technological design because they fostered competition. Mediators liked high-scores because competition encouraged use and increased revenues. Users liked competition because it was fun and a central aspect of community building. They sought "not only a chance to play, but a chance to improve, to become noteworthy."[64] Those who earned high-scores gained "clout" in "the competitive social environment of the arcade."[65] The system gave some benefit (though not necessarily equally) to all parties involved. Producers sold machines, mediators collected revenues, and users, as we shall see, paid to foster community and have a chance at increased social status.

Part Three - Gamer Communities

User communities were defined by "gamers" and "video arcades." "Gamer" denotes a dedicated user and was typically someone who organized their leisure time and/or identity around playing video arcade games. All gamers were users, but not all users were gamers. Rather, gamers were particularly consistent and active users. Most gamers patronized "video arcades," or spaces where video arcade games were the primary (and often sole) attraction. As described in chapter three, video arcades differed from other video arcade spaces in areas such as restaurants, bars, and child fun centers

[64] Kocurek, p. 204.
[65] Kocurek, p. 204.

because they featured video arcade games as a main rather than auxiliary experience.[66] The comparative lack of entanglements was conducive to the formation of gamer communities, and therefore designated video arcades as a locus of user interactions, consensus, and communal meaning making.

Gamers contributed to the significances of video arcade games through the communities they created. Though informal and loosely bound, gamer communities defined some of the motivations, behaviors, and social dynamics of play. For the most part, their practices were fashioned by the technologies they adopted. Scoring mechanisms, high-score displays, and placement in social spaces all prioritized certain types of engagement over others. In these ways user communities were shaped by producer and mediator decisions. However, gamers negotiated video arcade games to suit their individual and group needs in ways that had unintended consequences important to the experience and meaning of the technology.

Forming Community

Gamer communities developed slowly over time and in parallel with video arcade game spaces. At first, users organized around coin-op amusement technologies generally rather than video arcade games specifically.[67] Gamer communities rarely formed until 1979, when the popularity of *Space Invaders* (1978) led to increased public interest and encouraged mediators to shift the ratio of machines in coin-op amusement spaces to include a higher percentage of video arcade games. The similar success of *Asteroids*

[66] Chapter three, "Crafting Video Arcade Game Spaces."
[67] Kunkel, p. 10-11.

(1979) prompted the rise of video arcades. Video arcades were explicitly organized around video arcade games as a social and entertainment experience, and were a comfortable place to come together over play and shared interests. They were therefore highly conducive to community formation.[68] *Electronic Games* reverently called video arcades "cathedrals of sight and sound" and ran a serial feature on particularly "comfortable and inviting" locations.[69] Hirschfeld argued that "arcades, far from isolating players from the rest of the human race, are becoming major neighborhood social centers."[70] They functioned "like clubs, with members drawn together by common interests and friendly competition."[71] User Michael Rubin wrote that "most serious gaming" took place in video arcades due to lack of distractions and a typical commitment to maintaining "a good variety of games, most in beautiful condition."[72]

Community formation was aided and shaped by video arcade game design and placement. Following in the tradition of pinball and electromechanical novelties such as shooting galleries and strength testers, producers emphasized competitive interactions when developing video arcade games, both direct player versus player competition and

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[68] Ralph Lally, ed. "'The year the industry found itself:' Reviewing the coin-op year 1981," *Play Meter*, Vol. 7, No. 23, December 1981, p. 20.
[69] Arnie Katz, ed. "Arcade Spotlight," *Electronic Games*, Vol. 1, No. 2, March 1982, p. 12-13; Roger C. Sharpe. "The History of Arcades," *Electronic Games*, Vol. 1, No. 5, July 1982, p. 29.
[70] Hirschfeld, p. i.
[71] Hirschfeld, p. i.
[72] As described in chapter three, video arcades were comparatively free of distractions and committed to gaming as competition, sport, and community. Other video arcade game spaces such as bars and cocktail lounges often featured "distracting" lights and music, and "playing under the influence is never done when you want some "real" gaming." Restaurants and pizza parlors were "not for ideal gaming" because the spaces rarely featured more than a few machines and were often unclean (*Defending the Galaxy* cited "tomato-covered machines"). Other video arcade game spaces (supermarkets, mini-marts, airports, etc.) were only to be patronized out of convenience or "in emergencies." See Rubin, ed., p. 190-192. See also Albin, p. 3.

indirect competition over high-scores.[73] Video arcade games were therefore intended to support user interactions. Mediators placed machines in public spaces where "the context for multiplayer games had already been set by the long tradition of darts, pool, and other games."[74] The social context of the spaces characterized the technologies within them, and therein designated video arcade games a social technology.

Competition was the fundamental ethos of gamer communities. Gamers competed with each other, with the machines, and with themselves. Besides having fun, the underlying goal of play was to improve and gain enough skill to "beat your friends and relations more often than they beat you."[75] Tournaments, both for high-scores and "iron man" competitions to see who could play the longest on a single game for a single quarter, were fairly common (fig. 4-1). The largest and most impressive were reported on by user publications.[76] Dubren recommended that "serious players" organize local tournaments because there was "nothing like a good contest to raise people's spirits" and it was "a great way to get to know a lot of those anonymous initials" listed on high-score tables.[77]

The importance of competition to gamer communities is exemplified by the Twin Galaxies video arcade in Ottumwa, Iowa. Founder Walter Day began compiling a list of

[73] "The Company," Atari, Inc. Atari, Inc. Business Plans, 1974-1975, Box 1, Folder 1.
[74] Nick Montfort and Ian Bogost. *Racing the Beam: The Atari Video Computer System* (Cambridge: MIT Press, 2009), p. 9.
[75] Frank Tetro Jr. "Strategy Session," *Electronic Games*, Vol. 1, No. 1, Winter 1981, p. 29.
[76] See, for example, Joyce Worley, ed. "Tron Tournament," *Arcade Express*, Vol. 1, No. 1, August 15, 1982, p. 5; Joyce Worley, ed. "Gaming Parlors Cooperate in Oklahoma City Tournament," *Arcade Express*, Vol. 1, No. 5, October 24, 1982, p. 4.
[77] Dubren, p. 136.

Figure 4 - 1: *Asteroids* tournament in San Francisco, ca. 1981-1982. Bay Area video arcades: photographs by Ira Nowinski, 1981-1982, Stanford University Special Collections, Stanford University Libraries, Stanford, CA

nationwide high-scores in 1982. He recalled

> Someone playing *Defender* (1981) ran up a high score of about 24,000,000 points. We thought it might be an all-time record, so we started calling up other arcades to ask. But no one seemed to know if it was the high mark. So we decided to call it the official record until we heard otherwise. We did the same thing for other games. The next thing we knew, people were calling to report other records, or to find out the record score for a particular game. We were on our way to becoming a national institution.[78]

[78] Joe Claro, ed. "Twin Galaxies International Scoreboard,'"*Blip*, Vol. 1, No. 1, February 1983, p. 11.

For a brief span between 1982 and 1984, Twin Galaxies was "the center of video gaming in the world." [79] Rubin described that "gamers of all ages and from every state in the union actually *go* to Ottumwa to prove their scores or set new ones."[80] The arcade became a mecca of competitive play where the electronic achievements of great gamers could be celebrated.

Gamer communities built hierarchies through competition, and the social dynamics they created influenced video arcade game experience. Technological engagement and interactions between users were grounded in a meritocracy based on video game skill. High-scorers had "real status" with the gamer community.[81] Some video arcade spaces prominently displayed lists of its all-time high-scores.[82] Particularly impressive scores were reported by fan publications such as *Blip* and *Arcade Express*.[83] Even outside of high-scorers, users were "often judged by how many levels they've advanced in a certain game."[84] The more skill a user displayed, the more admiration they accumulated. User Matthew Laborteaux described that mastering a game "That's, like, the ultimate. Just to be able to go in and wipe up on a game and everyone else is just

[79] Though often lauded in 1982 and 1983, Twin Galaxies was one of the casualties of the 1983 crash and closed in 1984. Rubin, ed., p. 193
[80] Rubin, ed., p. 193. Original emphasis.
[81] See Kubey, p. xvii. See also George Sullivan. "Video Hall of Fame," *Blip*, Vol. 1, No. 2, March 1983, p. 8.
[82] Albin, p. 3.
[83] See, for example, Sullivan, March 1983, p. 8; Joyce Worley, ed. "Honor Roll: The Nation's Highest Scores," *Arcade Express*, Vol. 1, No. 1, August 15, 1982, p. 8.
[84] Len Albin described "In *Tempest*, for example, a player who's reached the yellows is obviously better than one who's reached on the blues or reds, but far behind those who've reached the greens." Albin, p. 6.

going '*Wow!*'"[85] Conversely, users could feel the "humiliation of having someone look over your shoulder at what is obviously inept or inexperienced play."[86]

For the most part, the dynamics of gamer communities were an intended consequence of producer design and mediator placement patterns. Competition generated interest and gave users a goal.[87] Because high-scores and proficiency were attached to status, competition also encouraged gamers to invest time and money in order to gain skill. The end result was not only the formation of gamer communities, but also greater profits for mediators and, in turn, producers.

Although competition largely served producer and mediator interests, it had unintended consequences that allowed users to partially undermine the economy of the arcade. To reward skill and encourage investment, video arcade games included mechanisms that tied extra lives/credits to player score.[88] The design allowed experienced gamers to play longer for less money, and therefore be better competitors and generate higher scores. However, gamers competed not just with each other, but also communally against the machines. Beating the machines was usually more important

[85] Matthew Laborteaux, as quoted in Albin, p. 6. See also Uston, p. xi.
[86] Dubren, p. 2.
[87] Hirschfeld, p. 1; Mayhem, p. 1.
[88] Essentially, when a player reached a certain score they were rewarded with extra attempts. For example, in *Pac-Man* (1980) players received a "bonus packman (sic)" at 10,000, 15,000, or 20,000 points depending on internal configuration. *Space Invaders* (1978) awarded a "bonus base" at 1,000 or 1,500 points. *Asteroids* (1979) awarded "an extra ship each time a player's score reaches multiples of 10,000; i.e., one ship is awarded at 10,000 points, another ship at 20,000 points, etc." "*Asteroids* Operation, Maintenance, and Service Manual, 1979," The International Arcade Museum. http://www.arcade-museum.com/manuals-videogames/A/Asteroids.pdf (accessed 5/5/15); "*Pac-Man* Parts and Operating Manual, 1980," The International Arcade Museum. http://www.arcade-museum.com/manuals-videogames/P/Pac-Man.pdf (accessed 5/5/15); "*Space Invaders* Parts Catalog, 1978," The International Arcade Museum. http://www.arcade-museum.com/manuals-videogames/S/Space%20Invaders%20Upright%20%20Midway.pdf (accessed 5/5/15).

than outdoing other players. Users were therefore united by a common goal that encouraged the free exchange of tips, tricks, and methods.[89]

Discussion and observation allowed users to compare strategies and gain a measure of skill without investing money, thereby circumventing some of the initial costs of proficiency. User, journalist, and amateur historian Steve Bloom advised users to "talk about the games with anybody" in a video arcade because "unraveling a good video puzzle takes as many heads as you can get."[90] Hirschfeld advised users to enlist a friend to "supply advice and constructive criticism" and help develop better play techniques.[91] He added that "he or she will be able to observe a game's workings objectively without the pressure of playing it" and therefore provide constructive "comments and insights."[92] Speaking with gamers and observing their play was an opportunity to develop patterns, techniques, and plans. For example, while playing *Space Invaders* gamers noticed that the points granted for shooting a bonus "UFO" varied, either 50, 100, 150, or 300 points. Through experimentation and collaboration gamer communities discovered that the UFO appeared exactly every twenty-five seconds and yielded 300 points only if struck by the twenty-third shot in a given screen and/or every fifteenth shot thereafter.[93] Hirshfeld described that "perhaps no one player discovered the secret, but it is a secret no more"

[89] As Craig Kubey advised users "If you're alert, playing over and over will teach you most of the strategies and techniques the video aces know. It will also bring into contact with top players whose games you can watch, who will likely offer advice without being asked, and who will almost always answer questions, provided those questions aren't asked during a rough part of a game." Kubey, p. 9.
[90] Bloom, p. 199.
[91] Hirschfeld, p. 6.
[92] Hirschfeld, p. 6.
[93] Hirschfeld, p. 57.

and claimed that "practically every half-serious player knows it."[94] Employing the pattern meant higher scores, extra lives/credits, and more play for less money.

In-Group/Out-Group Boundaries

Gamer communities were formed under meritocratic conditions that were, in principal, inclusive to all users. If another user asked to be second-player on a video arcade game, the proper response was "sure" even if "the character asking the question hasn't shaved in three days, neither uses nor can spell deodorant, and has fresh whiskey stains."[95] In their study of video game culture, psychologists Geoffrey and Elizabeth Loftus described that there was a "decidedly mixed crowd" in video arcades.[96] Though most players were "typical teenagers" who played "video games for at least a few hours every week," it was "not an uncommon sight" to see "the corporate executive, the housewife, the construction worker."[97] Kubey noted that while most users were "young men" there were also "women of all ages," children, and "men of middle age and beyond."[98] Some gamers undoubtedly attempted to draw boundaries based on age, gender, socioeconomic status, or race, but written accounts suggest that the overwhelming majority of gamer communities were explicitly open to people of any "age, race, creed, color, or nation of origin."[99]

[94] Hirschfeld, p. 6.
[95] Kubey, p. xiv.
[96] Loftus and Loftus, p. 3.
[97] Loftus and Loftus, p. 3.
[98] Kubey, p. xiii.
[99] Baker, p. 11. See also Beamer, p. 15; Kubey, p. xiii, Rubin, ed., p. 119-121.

However, the meritocracy of video arcade game competition came with unintentional in-group/out-group dynamics regarding gender. The vast majority of high-scorers were men. Of the few hundred high-scores posted in *Arcade Express'* serial "Honor Roll: The Nation's Highest Scores" column, only six belonged to women.[100] Of the list of high-scores for fifty-seven popular games published in *Defending the Galaxy*, a handbook of video gaming, none were held by women.[101] High-scores were attached to social status, and the hierarchy of the arcade was therefore dominated by men. The reason for this discrepancy is not entirely clear. Though there were more male gamers than female gamers, the difference in numbers was not as overwhelming as represented by high-scores.

The long-standing social dynamics of arcades was probably a contributing factor in disproportionate female representation. Coin-op amusements were "a male hobby" dating back to the first penny arcades.[102] Traditional coin-op amusement locations were "as much a strictly male preserve as the old corner barbershop (fig. 4-2)."[103] Joyce Worley, who edited *Arcade Express* and worked on *Electronic Games*, wrote that "when a woman did actually show up" to an arcade "she could usually be found hanging timidly

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[100] Two were for home video games: one by *Arcade Express* editor Joyce Worley on *Scramble* (1982) and one by Bonnie Starnes of Randolph, TX, on the Atari VCS' *Seaquest* (1983). The four video arcade game high-scores were all credited to Tracy Parish of Millington, TN, on *Frenzy* (1982). Joyce Worley, ed. *Arcade Express*, Vol. 1, No. 3, September 12, 1982, p. 8; Joyce Worley, ed. "Honor Roll: The Nation's Highest Scores," *Arcade Express*, Vol. 1, No. 5, October 10, 1982, p. 8; Joyce Worley, ed. "Honor Roll: The Nation's Highest Scores," *Arcade Express*, Vol. 1, No. 8, November 21, 1982, p. 8; Joyce Worley, ed. "Honor Roll: The Nation's Highest Scores," *Arcade Express*, Vol. 1, No. 22, May 22, 1983, p. 8.

[101] Rubin, ed., p 198-200.

[102] Erkki Huhtamo. "Slots of Fun, Slots of Trouble: An Archaeology of Arcade Gaming," in Joost Raessens and Jeffrey Goldstein, eds. *Handbook of Computer Game Studies* (Cambridge: MIT Press, 2005), p. 13-14; David Nasaw. *Going Out:The Rise and Fall of Public Amusements* (New York: Basic Books, 1993), p. 154.

[103] Joyce Worley. "Women Join the Arcade Revolution," *Electronic Games*, Vol. 1, No. 3, May 1982, p. 31.

at the fringes of the action, watching her date prove his masculinity."[104] The social complexion of the space meant that women "rarely actually played the machines, and so didn't perform very well on those infrequent occasions when they did stick a coin in the slot."[105] As video games became popular, women were more likely to engage them via consoles played in the "friendly surroundings" of their own homes.[106] The meritocracy of the video arcade often seemed egalitarian, but as a group men enjoyed considerable advantage due to the cultural characteristics of arcade spaces.

Figure 4 - 2: Arcade in the San Francisco Bay Area, ca. 1981-1982. Despite the crowd, no women are visible. Additional photographic records suggest that while some women did patronize in video arcade spaces, they were a distinct minority. Bay Area video arcades: photographs by Ira Nowinski, 1981-1982, Stanford University Special Collections, Stanford University Libraries, Stanford, CA

[104] Worley, May 1982, p. 31.
[105] Worley, May 1982, p. 31.
[106] Worley, May 1982, p. 31-32.

Furthermore, not all video arcades catered equally to men and women. Men had more opportunities to play video arcade games because, as explained by psychologist Bill Berman, they generally had "more money in their pocket" and "more freedom" than women.[107] Many video arcades, especially seedier ones in the mode of older coin-op amusement spaces, were inhospitable to women.[108] "Tawdry center-city game rooms" and "sleazy dives" were less prevalent by percentage during the Golden Age, but many still existed and many others were built in their model.[109] Most were "situated on the backstreets of town or in neighborhoods so dangerous that few women would risk visiting one."[110] Men therefore enjoyed greater access to video arcade games, and had more opportunities to shape gamer communities.

Women were "making gains" in gamer communities just before the 1983 North American video game crash. Alan Saffron, a coin-op industry consultant, explained that between 1981 and 1982 video arcade games entered an "era of appealing in earnest to the ladies, as well as to men."[111] Video arcade games such as *Pac-Man* and *Centipede* (1981) broke from typical male themes in refreshing ways.[112] The increasing prevalence of "sleek and polished" video arcades provided a safe environment for women to play. "Liberated ladies" began to "challenge the men's best scores," and developed an

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[107] "Atari Coin-Op Press Clippings, 1982," Steve Bristow Papers, Box 16, Folder 1.
[108] Kocurek, p. 196.
[109] Kubey, p. 217.
[110] Worley, May 1982, p. 31.
[111] Ralph Lally, ed. "Coinman Interview: Alan Saffron," *Play Meter*, Vol. 9, No. 10, June 1983, p. 55.
[112] *Centipede* was famous for its female player base, and Joyce Worley claimed the *Pac-Man* succeeded largely because it was female-friendly: "No discussion of women as electronic gamers would be complete without a deep bow in the direction of Midway's incomparable *Pac-Man*. The game's record-shattering success derives from its overwhelming popularity among female gamers. Oh, it does well among men, too, but it was heavy play by women that enabled *Pac-Man* to set earnings records in 1981." Worley, May 1982, p. 32.

appreciation for video gaming as an "activity in which the sexes can compete on absolutely equal terms."[113] However, as a group women never achieved equal inclusion. The 1983 crash, which led to precipitous drop in video arcades and prompted many mediators to retreat into traditional models, may have cut the process short.[114]

Part Four - Users and Non-Users

By 1981 video games had become a significant part of American culture. A Gallup poll of 1,010 users aged thirteen to eighteen suggested that 93% of United States teenagers had played video games (fig. 4-3). Most played only occasionally, but over a quarter played for an hour or more per day.[115] Of those, slightly more came from blue collar households than white collar households. No major demographic differences in play rates were found between boys and girls (though based on the accounts above it can be safely assumed that girls were playing primarily on home consoles) or geographic regions. Video game use was widespread and nearly universal among young people. It permeated pop culture. *Pac-Man* (1980) is a prime example. As listed in *Defending the Galaxy*,

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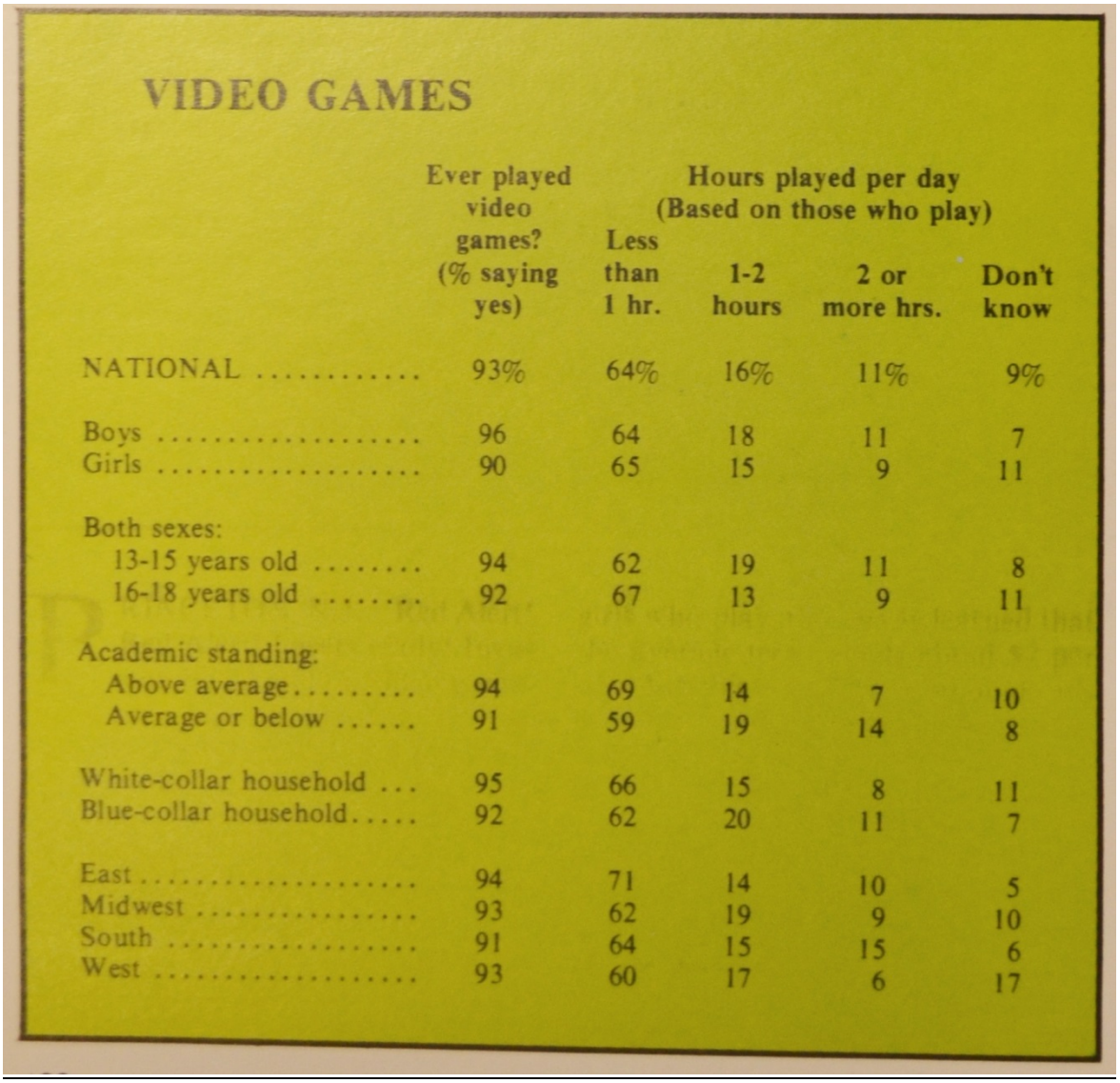
[113] Joyce Worly explained "This is certainly not the case with such popular pastimes as tennis, swimming, and basketball. The size and strength advantage which most men possess simply doesn't count (in video arcade games): Dexterity, finesse and quick thinking are the main ingredients of electronic gaming success." Another user described her time in the arcades as empowering: "It felt good because girls could even be competitive with the guys. I even got good enough to beat their scores." "Atari Coin-Op Press Clippings," 1982, Steve Bristow Papers, Box 16, Folder 1; Worley, May 1982, p. 31.

[114] See chapter three, "Retrenchment."

[115] Sixty-four percent reported that they played less than one hour per week, sixteen percent between one and two hours, and eleven percent two hours or more. Nine percent of respondents said they didn't know how long they played. George Gallup. "Video game craze sweeps teenage America," *Play Meter*, Vol. 8, No. 22, November 1982, p. 100.



VIDEO GAMES

	Ever played video games? (% saying yes)	Hours played per day (Based on those who play) Less than 1 hr.	1-2 hours	2 or more hrs.	Don't know
NATIONAL	93%	64%	16%	11%	9%
Boys	96	64	18	11	7
Girls	90	65	15	9	11
Both sexes:					
13-15 years old	94	62	19	11	8
16-18 years old	92	67	13	9	11
Academic standing:					
Above average	94	69	14	7	10
Average or below	91	59	19	14	8
White-collar household	95	66	15	8	11
Blue-collar household	92	62	20	11	7
East	94	71	14	10	5
Midwest	93	62	19	9	10
South	91	64	15	15	6
West	93	60	17	6	17

Figure 4 - 3: A section of George Gallup's 1982 video game poll. Gallup, George. "Video game craze sweeps teenage America," *Play Meter*, Vol. 8, No. 22, November 1982, p. 100.

> The Pac presently has his face on (among the some 500 things): mugs, cups, glasses, visors, lamps, jogging suits, posters, pants, toothbrushes, wastebaskets, buttons, ties, lunchboxes, pens, Frisbees, T-shirts, bumper stickers, air freshener, candles, lanterns, blankets, greeting cards, sleeping bags, pinball machines, cookies, telephones, radios, beach towels, flashlights, erasers, raincoats, pajamas, stationery, key rings, license plates.[116]

[116] Rubin, ed., p. 185.

A Saturday morning cartoon show based on Pac-Man ran on ABC from 1982 to 1983, and for a time was "tops in its time slot."[117] Buckner and Garcia's "Pac-Man Fever" video arcade game concept album was released in 1982, and its title track became a top-ten hit.[118] Looking back, video game journalist Van Burnham reflected "A great deal of what fueled the 'golden age' of videogames in the early eighties was the fact that the aesthetic of games permeated everything all at once – video arcades, movies, fashion, television, technology, music, and media."[119]

As the popularity and visibility of video arcade games increased, users found themselves competing with non-users over meaning.[120] Most non-user opinions of video arcade games were benign. A majority believed "that video games represent a superficial, momentary, and passing delight, and not part of a significant trend or development within our society and culture."[121] Users countered that "video games are not a fad" and were "very much here to stay," but while the issue was contentious it was not particularly heated.[122] A few non-users welcomed video games as part of a wave of computerization and felt it was "only natural that our electronic entertainments should be combined with computers to produce the future *now*."[123] However, the most vocal group of non-users

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[117] Joyce Worley, ed. "Pac Man is Top Kids Hit on T.V." *Arcade Express*, Vol. 1, No. 12, January 16, 1983, p. 4.
[118] Gabe Essoe. "Dear Pac-Man," *Electronic Games*, Vol. 2, No. 10, December, 1983, p. 46-52.
[119] Van Burnham, ed. *Supercade: A Visual History of the Video Game, 1971-1984* (Cambridge: MIT Press, 2001), p. 22.
[120] By engaging non-users as a category of actors, this study follows Sally Wyatt's call to "take non-users and former users seriously as relevant social groups, as actors who might influence the shape of the world." Sally Wyatt. "Non-Users also Matter: The Construction of Users and Non-Users of the Internet," in Oudshoorn and Pinch, p. 78.
[121] Beamer, p. 17.
[122] Hirschfeld, p. iii; Arnie Katz. "Switch On," *Electronic Games*, Vol. 1, No. 5, July 1982, p. 6.
[123] Beamer, p. 17. Original emphasis. See also "Atari Coin-Op Press Clippings," 1982, Steve Bristow Papers, Box 16, Folder 1.

thought video gaming was a deviant and immoral activity. The resulting "moral panic" prompted users to defend video games against a vocal and hostile non-user minority.

Non-Users and Moral Panic

In the early 1980s moral objections to video games were common and widely reported.[124] The majority of non-users were ambivalent and a few were vocal proponents, but a politically and culturally significant number saw video games as a threat to the moral fabric of society.[125] *Electronic Games* editor Arnie Katz wrote that the "tremendous popularity" of video arcade games "attracted the attention of a few militant spoilsports" who were trying "to take the fun out of it for the rest of us."[126] Charles Beamer, a "concerned parent" but also a user sympathizer, explained that a group "made up of parents, teachers, law enforcement officers, and city government officials" were particularly "concerned" about the effects of video game use on "tender, vulnerable areas of young people's lives."[127] Indeed, most claims of video game corruption centered upon minors.

[124] See, for example, Joe Claro, ed. "News Blips," *Blip*, Vol. 1, No. 1, February 1983, p. 20. See also chapter one, "Moral Panic."
[125] Non-users who were proponents of video games cited social and education benefits as reasons for support. Their views are well summarized in a lengthy defense of video arcade games published in a local newspaper in Newport, Rhode Island: "Parents and schools should take advantage of the fact that children are attracted to machines that stress mental, eye and hand skills. In an earlier day, unathletic youngsters who starred in academics had to take a back seat to more physical classmates who starred on sports teams. Now, children who are not athletically skilled can achieve peer group recognition through their ability to perform on electronic games. This is good for them psychologically and should be so recognized by their elders." The article went on to praise the interactivity of video games as opposed to television and concluded that "Computers represent the world of the future. Let us encourage our young people to become a full part of that world." "Atari Coin-Op Press Clippings," 1982, Steve Bristow Papers, Box 16, Folder 1.
[126] Laney Jr., March 1982, p. 6. Written by Arnie Katz under a pseudonym.
[127] Beamer, p. 18.

Ronnie Lamm, a mother living in Long Island, was one of the founders of the anti-video game movement. In the late 1970s and early 1980s she was a vocal campaigner and was interviewed by several television programs and newspapers.[128] As a spokesperson, her views both reflected and defined the moral panic over video games. In a *New York Times* article in 1982, Lamm argued that video games were "corrupting our youth" and "teach gambling and breed aggressive behavior."[129] She described video arcades as centers of corruption: "Only the bad kids go into them, and we worry about the young children not old enough to make value judgments. Those without strong moral codes can be drawn in. They don't know they are hooked."[130] She called mediators "scum coming out of the woodwork" and "absolute dregs" who were only interested in profit and turned a blind eye to "unacceptable language," "antisocial behavior," and underage drinking.[131] She had visited video arcades, but had never played a video arcade game "for the same reasons I did not gamble when I was in Puerto Rico."[132] Video gaming was intrinsically "not wholesome," and therefore unwelcome in American society.[133]

Lamm's views were echoed by what the *New York Times* called "a rapidly growing army that is rising up in communities across the country to beat back the tide" of video games.[134] "Angry parents" complained to their local governments that video arcade

[128] Tom Sito. *Moving Innovation: A History of Computer Animation* (Cambridge: MIT Press, 2013), p. 112.
[129] William E. Geist. "The Battle for America's Youth," *New York Times*, January 5, 1982. http://www.nytimes.com/1982/01/05/nyregion/the-battle-for-america-s-youth.html (accessed 4/29/15)
[130] Geist, January 5, 1982.
[131] Geist, January 5, 1982.
[132] Geist, January 5, 1982.
[133] Geist, January 5, 1982.
[134] Geist, January 5, 1982.

games encouraged truancy, loitering, and wasteful spending.[135] Concerned citizens worried that kids would "become addicted" and "might perhaps try to steal money to feed the machine."[136] Underlying these more serious complaints was the sense that video games took "valuable time away" from traditional and/or supposedly more constructive activities "such as study, sports, creative projects, and outside play."[137] Anti-video game activists called on the public to "objectively view these video games for what they really are – a lethargic, relatively inanimate pastime of no significant value."[138]

These criticisms were not entirely frivolous. Students were just as likely to have played video games regardless of academic standing, but "average or below" students were more likely to play for longer periods and twice as likely to play two or more hours per day.[139] Users admitted that video arcade games felt "addictive."[140] Bloom cautioned that "video games can be a lot like gambling and even addictive" and that it was important to "know when to stop."[141] Katz similarly stated that "no one is advocating that folks become monomaniacal arcades" and "moderation is the watchword here."[142] Some video arcades actually were hubs for drinking, drug use, and criminal behavior.[143] Moral panic arguments had weight, which is what made them so dangerous to users.

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[135] Martin Jaffe. *Regulating Video Games* (Chicago: American Planning Association, 1982), p. 2.
[136] "Atari Coin-Op Press Clippings, 1982," Steve Bristow Papers, Box 16, Folder 1.
[137] "Atari Coin-Op Press Clippings, 1982," Steve Bristow Papers, Box 16, Folder 1.
[138] "Atari Coin-Op Press Clippings, 1982," Steve Bristow Papers, Box 16, Folder 1; Ralph Lally ed. "Detroit Council Wants Security Guards," *Play Meter*, Vol. 9, No. 17, September 1983, p. 12-14.
[139] Gallup, November 1982, p. 100.
[140] Kubey, p. xiv.
[141] Bloom, p. 200.
[142] Laney Jr., March 1982, p. 6. Written by Arnie Katz under a pseudonym.
[143] "Atari Coin-Op Press Clippings, 1982," Steve Bristow Papers, Box 16, Folder 1.

Defending Play

Arcade Express and *Electronic Games* were staunch defenders of video games. Both did what they could to organize users to diffuse moral panic. After United States Surgeon General C. Everett Koop called video games "hazardous to the health of young people," Worley published an editorial in *Arcade Express* calling for a "write-in campaign to acquaint the Surgeon General – and the president who appointed him – with the way Americans feel about Dr. Koop's intemperate assault on video games."[144] *Electronic Games* supplied a template letter to be filled out, sent to the magazine, and then forwarded on. Katz punctuated the call by writing "Now is the time for electronic gamers across the land to make their voices heard. Let's prevent misguided nay-sayers from unplugging our fun."[145] When a budgeting committee in Jacksonville, FL barred the purchase of a *Ms. Pac-Man* (1981) machine for the local jail, *Arcade Express* called it "prejudicial" because other games, such as pool, were permitted.[146] It reported a video arcade game ban in Marshfield, MA, under the headline "Patriots Spin in their Graves as Mass. Town Bans Videogames" and led with the line "Lady Liberty took another

[144] "Surgeon General Sees Danger in Video Games," *New York Times*, November 10, 1982. http://www.nytimes.com/1982/11/10/us/around-the-nation-surgeon-general-sees-danger-in-video-games.html (accessed 5/28/15); Joyce Worley ed. "Koop Blasts Videogames," *Arcade Express*, Vol. 1, No. 9, December 5, 1982, p. 1.
[145] Joyce Worley ed. "Guest Editorial: Coping with Dr. Koop," *Arcade Express*, Vol. 1, No. 9, December 5, 1982, p. 8.
[146] Joyce Worley, ed. "Florida Prisoners Get No Pac-Man," *Arcade Express*, Vol. 1, No. 4, September 26, 1982, p. 4.

beating." Worley described the legislation as unreasonable and suggested that it was unconstitutional.[147]

Users responded to the moral panic in a variety of ways, but most commonly described stark differences between moral panic rhetoric and their own experiences. Few users denied that video games could have some negative consequences, but most questioned the cause-and-effect link between video games and criminality.[148] Users wrote to newspapers and expressly stated that they had not witnessed any criminal behavior associated with either video arcades or video games.[149] For example, in 1982 one user responded to a local newspaper article entitled "These games are corrupting our youth." He noted with some indignation that "I play these games every chance I get, but I don't mug people, forget my homework or take part in rumbles. When I go into arcades there are usually only a few supervisors, but I never have come across a typical half-wit or thug, and I usually have a good time."[150]

Non-user complaints were frequently cast by users as ill-founded and unfair. Blanchet described their objections as "plentiful but, on the whole, irrational," while Katz called them "often-ridiculous."[151] After the city council of Ventura, California, forbid video arcade games in a local teen center, a user proponent wrote to the local newspaper that singling out video games as a harmful vice was hypocritical. The violence depicted in video games was no worse "than the daily violence on TV and the violent stories in the

[147] Joyce Worley ed. "Patriots Spin in their Graves as Mass. Town Bans Videogames," *Arcade Express*, Vol. 1, No. 8, November 21, 1982, p. 4.
[148] "Atari Coin-Op Press Clippings, 1982," Steve Bristow Papers, Box 16, Folder 1.
[149] "Atari Coin-Op Press Clippings, 1982," Steve Bristow Papers, Box 16, Folder 1.
[150] "Atari Coin-Op Press Clippings, 1982," Steve Bristow Papers, Box 16, Folder 1.
[151] Blanchet, p. 6; Laney Jr., March 1982, p. 6, written by Arnie Katz under a pseudonym.

news."[152] If they truly were "addicting," they were "a lot better than cigarettes, alcohol and drugs" because they weren't obviously harmful to the player's health.[153] Being addicted to video games was no different from being "addicted to tennis, golf, etc."[154] Albin argued that the abstract combat in video games was no different from "the game of chess, which is lauded as an intellectual pursuit."[155] Non-user inconsistencies were opportunities for users to provide persuasive rebuttals.

Users also countered that video games had positive side effects. Katz argued that "arcade games improve hand-eye coordination to a remarkable extent" and "more complex" games "sharpen the mental faculties."[156] Play had a "beneficial effect on the mental state of the arcader" because "blasting space debris and zapping aliens" gave users "a healthful release of tension and an outlet for the aggressive instincts most of us have at least to some extent."[157] Video gaming was preferable to "other popular pastimes" because it was "active rather than passive," allowing for stimulating interaction.[158] Users also articulated a sense that video games were the forerunners of computerization, and that play prepared them for the future. Hirschfeld described "In a society moving toward complete computerization, the games teach self-reliance and computer confidence."[159]

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[152] "Atari Coin-Op Press Clippings, 1982," Steve Bristow Papers, Box 16, Folder 1.
[153] "Atari Coin-Op Press Clippings, 1982," Steve Bristow Papers, Box 16, Folder 1. Katz similarly argued "electronic games are certainly more healthful and less harmful than a good man other activities that occupy people's leisure hours." Laney Jr., March 1982, p. 6. Written by Arnie Katz under a pseudonym.
[154] "Atari Coin-Op Press Clippings, 1982," Steve Bristow Papers, Box 16, Folder 1.
[155] Albin, p. 7.
[156] Laney Jr., March 1982, p. 6. Written by Arnie Katz under a pseudonym.
[157] Laney Jr., March 1982, p. 6. Written by Arnie Katz under a pseudonym.
[158] Laney Jr., March 1982, p. 6. Written by Arnie Katz under a pseudonym.
[159] Hirschfeld, p. ii.

Competing Meanings

Non-users were able to enact barriers to video arcade game play.[160] Various municipalities scattered across the United States enacted "ordinances limiting or prohibiting videogames."[161] For example, Lamm successfully blocked seventeen applications to open local arcades in her community of Centereach, New York. She also campaigned (with some success) in nearby communities by "circulating petitions, making speeches before official bodies and community groups, sending out mass mailings and talking with state officials about legislation."[162] Similar efforts limited access to video arcade games and blocked the formation of gamer communities reliant upon the space and social dynamics of video arcades.

Users were unsuccessful in stemming the moral panic over video games in large part because users and non-users were speaking to different social demographics. Users failed to recognize that non-user objections had less to do with the realities of video games than with what they represented. The moral panic was about video games insomuch as they were unfamiliar computer technologies that, in the case of video arcade game varieties, held the stigma of coin-op amusements. They were therefore emblematic of both the changing world and the perceived decay of American culture, what President Jimmy Carter called a "crisis of confidence" in the late 1970s and early 1980s.[163] Video

[160] A variety of barriers are described in detail in chapter one, "Moral Panic."
[161] Jaffe, p. 2.
[162] Geist, January 5, 1982.
[163] Carter, July 15, 1979.

arcade games were popular and highly visible, and therefore a convenient technological focus for the expression of the social anxieties of older Americans.[164]

Part Five - From Arcades to Homes

User interest in video arcade games waned somewhat in 1982 and 1983. The novelty of the technology, which was originally represented by *Pong* and rekindled by *Space Invaders* and *Asteroids*, gradually wore off. Rodger Sharpe, a contributor to both *Electronic Games* and *Play Meter*, concluded that "once the uniqueness began to wear off" the "curiosity seeker and the faddist" "lessened their visits and finally stopped going" to video arcades.[165] The "solid audience" of gamers "found itself wanting more from each succeeding game," and for a variety of reasons producers released few quality products.[166] Users became "disenchanted" as "the field languished in knock-offs and spin-offs" and "lost interest when they were forced to go back to older games because new editions couldn't measure up."[167] Rodger Sharpe described, "Many players simply became disenchanted with the games. There they were hungry for the entertainment, but all they got were repetitions of familiar themes and game designs. When the industry really needed innovation the most, we received more of the same, not for a month or two, but for almost two years."[168] The amount of money users spent on video arcade games fell significantly and contributed to the 1983 North American video game crash.

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[164] Kocurek, p. 194.
[165] Roger C. Sharpe. "Paradise Lost: Why players left and how to get them back," *Play Meter*, Vol. 10, No. 20, November 1984, p. 60.
[166] Sharpe, November 1984, p. 60. See also chapter two, "Exodus from Atari" and "Imitation as Common Practice;" chapter three, "Buying Video Arcade Games."
[167] Sharpe, November 1984, p. 59-60.
[168] Sharpe, November 1984, p. 60.

Those people who continued to use video arcade games felt the effects of the crash later than producers and mediators. Though profits fell, the number video arcade games and arcade locations actually grew slightly in 1983. Many large arcades with high overhead costs went under, but smaller arcades and "street locations" (pizza parlors, bowling alleys, convenience stores, etc.) continued to proliferate.[169] But in 1984, the number of arcades dropped by twenty-two percent.[170] *Play Meter* estimated that there were "slightly more than 400,000 fewer video games on location than there were one year ago."[171] In March, Katz wrote that video arcade gaming was "winding down" and that *Electronic Games* would have to "make some changes" in order to "ride out the storm."[172] Its attempts were unsuccessful, and the magazine folded early in 1985.

As video arcade games declined the technological paradigm (the primary focus of both innovation and experience) of video games shifted to home consoles and computers. Some modes of experience, community, and technological meaning changed with it. Video game use lost some important qualities in the transition and gained others. Despite the switch, video arcade games did not disappear. Though the normative video game experience no longer took place in video arcades, use of the technologies of the era continued.

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[169] Ralph Lally, ed. "Operator's Fortunes Fall with Video Earnings," *Play Meter*, Vol. 9, No. 20, November 1983, p. 43-45.
[170] Ralph Lally, ed. "1984 – The Year of the Crunch," *Play Meter*, Vol. 10, No. 20, November 1984, p. 38.
[171] Lally, ed., November 1984, p. 39.
[172] Arnie Katz. "Switch On," *Electronic Games*, Vol. 2, No. 12, March 1984, p. 6.

Home Video Gaming

Home consoles became a popular alternative to video arcade games during the Golden Age. The Atari Video Computer System (VCS) home console, released in September of 1978, sold well in large part because it allowed users to play arcade favorites such as *Space Invaders* and *Missile Command* (1980) as much as they wished after initial purchase.[173] By late 1981 roughly one-third of United States teenagers were reported to have a home console in their household.[174] Over time home consoles began to encroach upon the market share of video arcade games, and by 1984 had become the most popular video gaming medium.[175] *Blip* presciently explained in 1983 "With each new technological improvement, the home systems come closer and closer to arcade realism. As more people discover the excitement of home systems, video arcades may soon become as dated as pinball parlors and pool halls."[176]

Computer gaming also drew users away from video arcade games. Evan as video arcade games became a part of mainstream American culture they lost much of the high-tech glamour that had contributed to their initial popularity. That appeal shifted to home computers with greater capacity for "simulations," and users attracted to high-tech switched to computers as their video game medium of choice.[177] Kunkel described, "I

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[173] Video arcade games and home consoles appear to have worked in complimentary tandem to increase overall video game popularity and cultural import. However, video arcade games drove game design. Individual video games were almost always engineered as coin-op machines first and only later re-engineered for home use. "Atari: There's no comparing it with any other video game" advertisement, *Electronic Games*, Vol. 1, No. 1, Winter 1981, p. 1-2; chapter two, "Exodus from Atari."
[174] Gallup, November 1982, p. 100.
[175] Sharpe, November 1984, p. 60. See also chapter two, "Home Consoles as Paradigm."
[176] Joe Claro, ed. "News Blips," *Blip*, Vol. 1, No. 2, March 1983, p. 13.
[177] Bill Kunkel, in Frank Cifaldi. "Playing Catch-up: Bill 'the Game Doctor' Kunkel Lets Loose," *Gamasutra*, December 12, 2005. http://www.gamasutra.com/php-bin/news_index.php?story=7481#.UJk0-cXAdkI (accessed November 12, 2012).

think a lot of people believed that video games had served their purpose, that they had been the foot in the door that enabled us to get on the computer and do really serious, important things."[178] *Electronic Games* gradually shifted focus to computer games in 1984, and after being sold in 1985 it was briefly rebranded as *Computer Entertainment*.[179] In March of 1984 David Lustig, a contributor to *Electronic Games*, wrote that "a new era, the computer game era, is dawning" because "computer games consistently offer sophisticated and increased graphics over their strictly game-playing cousins."[180]

Different Kinds of Play

Home video games had some advantages over video arcade games. In the midst of the moral panic, home consoles had the benefit of falling outside of the common regulatory powers of local governments. *Defending the Galaxy* listed the comparative parental acceptability of home consoles as a "special advantage" because "You can game even when your parents won't let you go out to an arcade (so what if you're forty?). Some rents think all arcades are 'dens of corruption.' Until they wise up, just plug in the cartridge."[181] By comparison with arcades, play on home consoles was cheaper per hour for the average user (though probably not for the very skilled gamer).[182] Personal computers were, at the time, comparatively expensive but had the advantage of being

[178] Kunkel, December 12, 2005.
[179] Louise Kohl. *Computer Entertainment*, Vol. 3, No. 5, May 1985 (volume and numbering continued from *Electronic Games* print run).
[180] David Lustig. "Can Electronic Gaming Survive the Big Shake-Out?" *Electronic Games*, Vol. 2, No. 12, March 1984, p. 24.
[181] Rubin, ed., p. 214.
[182] Kocurek, p. 193.

able to "file Mom's recipes and keep track of Dad's checks as well as play games."[183] Home video games were convenient because there were "no crowds and no rules," and could be played anytime a user wanted.[184] Users without great skill had "no need to get embarrassed by getting wiped with a crowd watching."[185]

Home video games could be more complex and explore more detailed narratives than their arcade counterparts because they did not have to follow the technological constraints of the economy of the arcade.[186] With the requirement for consistent player revenues removed, psychological reward structures could be reconfigured and it became more common for users to have the ability to "beat the game," or to reach a point where the player is victorious within the gameplay scenario. Producer, critic, and user Dan Bunton cited this as an improvement because "there is a limit to the pleasure I derive from games where the question is not 'will I lose' but '*when* will I lose.'"[187]

Despite these advantages, some users found home video gaming to be an inferior experience. Several argued that home video games were lesser copies of video arcade games. By comparison graphics were "at best poor" (especially on home consoles and less expensive computers) and the controls were "condensed: often five buttons are replaced by a joystick and one button," making home versions "not the same game."[188]

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[183] Lustig, March 1984, p. 24.
[184] Rubin, ed., p. 213-214. See also Kubey, p. 155.
[185] Rubin, ed., p. 214. Home video games also allowed novice users to "practice alone without fear of embarrassment." Kubey, p. 155.
[186] Sullivan, July 1983, p. 4.
[187] Dan Bunten. "Real World Gaming." *Computer Gaming World*, Vol. 2, No. 5, September –October 1982, p. 35. Original emphasis.
[188] Rubin, ed., p. 213. Ron Dubren expressed similar sentiments when describing *Centipede*: "(Lesser graphics) and other changes will no doubt make the home version a far cry from the original." Dubren, p. 140.

Dubren encouraged "fanatics" who couldn't "bear to be unfaithful to their true love" to pay the considerable expense of a full video arcade game cabinet rather than play a home adaptation of their favorite game.[189] Most importantly, home video games offered minimal opportunities to create or maintain gamer communities. In the 1980s home consoles and computer games were built around assumptions of solo or small group play and offered none of the community building advantages of video arcade games. They were limited because, as described by user David Myers, "the true value of any game… comes from sharing the experience with other, real-life players, exchanging strategies and tactics, and gaining insights into both games and gamers."[190]

Fortunately for users, video arcade games did not vanish when the technological paradigm that created them changed. They lingered as "monuments of an expeditiously eroding era of gaming, technology, culture, and (public) social experience."[191] The hard financial times following the crash drove many video arcades out of business, but some lingered.[192] The number of new video arcade games dropped precipitously, but some were still released. Producers moved on to focus on home video games, and mediators retrenched into traditional ones due to the economic fallout of the 1983 crash. However, video arcade games remained viable for users who preferred the medium, especially those willing to stick with old favorites rather than chase new novelties.

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[189] Dubren, p. 140.
[190] David Myers. "Atari: Exploiting the Human Connection," *Computer Gaming World*, Vol. 2, No. 5, September-October 1982, p. 15.
[191] Raiford Guins. *Game After: A Cultural Study of Video Game Afterlife* (Cambridge: MIT Press, 2014), p. 108. Original parenthesis.
[192] Kocurek, p. 192.

Chapter Five – Defining Play

The fundamental claim of this dissertation has been that the history of video arcade games was defined by the actions and interactions of producers, mediators, and users.[1] Each was part of a system of technological and economic exchange, and each contributed to the construction of form, function, and significance. To conclude, I will re-examine how each category helped to direct technological development and define the characteristics of play. I will also situate the history of video arcade games as a case study within the histories of computing and technology.

Defining Play

Producers had the most obvious effect on video arcade games. Their decisions had direct ramifications for technological development. They made choices about what video arcade games would be and where they fit into existing economic and social structures. Nolan Bushnell and later producers at Atari crucially designed and positioned video arcade games as coin-op amusement technologies. Coin-op industry practices shaped the technological paths of video arcade games, informing innovation, economics, gameplay, and meaning. Atari accepted many of these practices, but negotiated others to better meet mediator needs and generate user interest. As the video game business grew

[1] Non-users also contributed to the history of video arcade games. However, unlike producers, mediators, and users, they exerted only minor influence on technological development. Non-users acted either as passive non-actors, meaning they exerted little to no influence the technology, or active opponents. The latter were important because of the barriers they enacted against video arcade games, and they did contribute to the construction of technology significance. However, they were removed from the system of market feedback because they rejected the technology outright (video arcade games were categorically deviant, and I found no evidence that certain themes or designs were less objectionable to non-user opponents than others). Developing to their priorities and preferences was not relevant to the economic success of a given game, and they therefore had little effect on software, hardware, or gameplay design.

and became an important aspect of American culture, producers made advertent and inadvertent choices about who video games were for that influenced patterns of use. Producer decisions, especially at Atari, also contributed to the decline of video arcade games through the pursuit of other technological paradigms for video games, and by catalyzing the 1983 North American video game crash.

My dissertation explored important aspects of the producer story that have received little attention. The effects of coin-op amusement industry practices and structures on video arcade games have thus far been virtually ignored. The tacit assumption is that the founding of Atari marked a radical break and the formation of a new industry, and while there some truth to the characterization there was considerable continuity with previous models. Existing histories have also missed the effect of producers on user demographics. Producers were overwhelmingly male, and their corporate cultures were, at times, overtly sexist. The people making video arcade games made decisions about themes, presentation, and imagery that cast the vast majority of games as masculine and discouraged female engagement with the technology.

Mediators contributed to video arcade games through their business practices, the spaces they created, and market feedback. As the direct consumers of video arcade games, mediators influenced technological development through their purchasing practices. Video arcade games in turn affected the mediator population. When experienced and/or conservative mediators hesitated to adopt video arcade games in the mid-1970s it presented opportunities for “new blood” operators unintimidated by computer technologies. Changes to the mediator population introduced new business

models and eventually led to the proliferation of video arcades, thereby establishing important parameters for video arcade game use and experience. Mediators also exacerbated the 1983 crash through undiscerning purchasing practices, market saturation, and an inability to effectively combat anti-video game actions by local governments. Following the crash they contributed to a shift in technological paradigm by eschewing new video arcade game purchases in favor of existing machines and more traditional coin-op amusements. Mediator retrenchment caused the market for video arcade games to decline and encouraged producers to focus their efforts on other forms of video games.

The mediator story is all but invisible in existing histories. Discerning mediator influences requires viewing video arcade games as coin-op amusements. Because this is a connection that most other histories miss, the role of mediators has generally escaped notice. As the primary market for video arcade game purchases, mediators stood at a consumption junction that gave them some influence over technological development. They also stood at a mediation junction between producers and users, and performed important functions by placing machines and translating user desires into purchasing practices. Mediators were integral to the video arcade game business and made critical contributions to development, experience, significance, and economics.

Users were the end consumers of video arcade games and formulated the culture of play. Though powerfully influenced by producer and mediator practices, users navigated the economy of the arcade in important ways. Their priorities were a key determinant in which games succeeded and which failed, and had to be considered during design and placement. They constructed technological meanings of video arcade games

as social and competitive technologies, and identified video arcades as loci for community formation and exchange. The meritocratic hierarchies they established shaped the experience of play, and also inadvertently characterized video arcade games as young and masculine due to the long-standing social dynamics of arcade spaces.

The user perspective has frequently been neglected in histories of video arcade games. It is difficult to encapsulate due to the number of users and relative paucity of sources, which may have discouraged amateur and professional historians alike. The inattention is unfortunate. Users acted within a set of technological and spatial boundaries established by producers and mediators, but within those boundaries defined culture and negotiated experience in powerful ways. Their priorities, exchanges, and experiences were particularly important to the formation of the first gamer communities, and continue to inform video game use.

Non-users also helped define play to a surprising degree. The "moral panic" over video arcade games in the early 1980s was central to public perceptions and video arcade game economics. Concerned non-users successfully lobbied local governments to enact various restrictions on placement and use, including prohibitively high fees, age restrictions, and zoning regulations that relegated some video arcades to "back alleys."[2] The identification of video games as deviant technologies contributed to the decline of video arcade games and continues to haunt the industry. Though they were not as formative as producers, mediators, or users, the history of video arcade games

[2] Martin Jaffe. *Regulating Video Games* (Chicago: American Planning Association, 1982).

demonstrates that non-users do indeed matter and are capable of shaping technological outcomes.[3]

The History of Video Arcade Games in the History of Computing

Video arcade games were the first technology to present non-specialists with a visual, identifiable, usable representation of the potential of computers. As described by J.M. Graetz, who worked on the original *Spacewar!* (1962), "When computers were still marvels, people would flock to watch them whenever the opportunity arose. They were usually disappointed. Whirring tapes and clattering card readers can hold one's interest for only so long… There was nothing much to see."[4] Video arcade games translated the spectacle of computer science laboratories into a public technology available to all. They introduced America to computers in important ways. As described by Al Alcorn, "It's funny because looking on it philosophically, [*Pong*] was one of the first digital devices ever to be in the hands of the people… certainly the first digital video device ever. And the interface was a knob with no instructions."[5]

Video arcade games brought computing to the masses in an enjoyable form. Though difficult to track, it's probable that video arcade games made computers more accessible, approachable and fun. At the very least, the rise of video games, which began with the spread of video arcade games, prompted the American public to buy computer

[3] Sally Wyatt. "Non-Users also Matter: The Construction of Users and Non-Users of the Internet," in Nelly Oudshoorn and Trevor Pinch, eds. *How Users Matter: The Co-Construction of Users and Technology* (Cambridge: MIT Press, 2005).
[4] Van Burnham, ed. *Supercade: A Visual History of the Video Game, 1971-1984* (Cambridge: MIT Press, 2001), p. p. 44.
[5] Allan Alcorn. "First-Hand: The Development of Pong: Early Days of Atari and the Video Game Industry." IEEE Global History Network: http://ieeeghn.org/wiki6/index.php/First-Hand:The_Development_of_Pong:_Early_Days_of_Atari_and_the_Video_Game_Industry.

technologies. As described by Geoffrey and Elizabeth Loftus in 1983, despite all of the practical promises of computers ("keeping the checkbook balanced, maintaining Christmas card lists, and teaching the children to program") "by far the major use of home computers is for video games, and indeed the potential home video game market provided a major incentive for the development of many home computers in the first place."[6]

The use of video arcade games sparked interest into the inner workings of computer hardware and software. For example, *Arcade Express* ran an announcement about several "National Computer Camp" locations where children aged nine to eighteen could spend their summers learning computer skills.[7] Its editor assumed that gamers would, by default, be interested in learning more about the technologies underpinning their favorite hobby. Tom Hirschfeld's video arcade game strategy guide included a basic description of computer architecture under the title "Know Your Enemy." He wrote "A video games expert doesn't have to be a computer whiz, but a rudimentary understanding of a machine's insides never hurts if you want to rule the outside. When you are analyzing the way a game thinks, you should know at least a little about the form of its brain."[8] He advised "The more you know about how games 'think,' the better you can analyze and master any game."[9]

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[6] Geoffrey R. Loftus and Elizabeth F. Loftus. *Mind at Play: The Psychology of Video Games* (New York: Basic Books, 1983), p. 4.
[7] Joyce Worley, ed. "Computer Camp Combines Recreation with Hands-On Educational Experience," *Arcade Express*, Vol. 1, No. 10, December 19, 1982, p. 2.
[8] Tom Hirschfeld. *How to Master the Video Games* (New York: Bantam Books, 1981), p. 2-3.
[9] Hirschfeld, p. 3.

Video arcade games primed future innovations by exposing a generation to computer technologies and stimulating interest in their design. As noted by Carly Kocurek, "[Video games] introduced thousands of people to computers as approachable, everyday technologies just as the workplace was entering a period of massive computerization."[10] To Van Burnham, the "golden age of videogames" marked "the point in time when society shifted from an analog to digital culture… [future computer innovations] were made possible because a generation was exposed to the future of technology in a way that made it accessible and, most of all, fun – through video games."[11] Ralph Baer similarly attributed advancements in computer graphics to video games, stating "If not for videogames and their enthusiasts – and the constant need to keep them enthused with ever-improving game graphics and lightning-fast speeds – advanced computer graphics would perhaps still be found only in the exclusive domain of universities and the high-tech world."[12]

The connection between video game use and computer engagement may help to explain the gender gap in the computing profession. Video arcade games were masculine technologies due to connections with previously established coin-op connotations and spaces. Most of the first home console games and many of the first computer games were either emulations or imitations of previously released video arcade games, and therefore held many of the same gender-based social and cultural meanings. Video games in general were therefore characterized as male technologies, despite the fact that women

[10] Carly A. Kocurek. "Coin-Drop Capitalism: Economic Lessons from the Video Game Arcade," in Mark J.P. Wolf, ed. *B*efore *the Crash: Early Video Game History* (Detroit: Wayne State University Press, 2012), p. 193.
[11] Burnham, ed., p. 23.
[12] Ralph H. Baer. "The Father of TV Games," in Burnham, ed., p. 18.

made up a significant percentage of users. Because video games were recognized as computer technologies, it follows that some video game connotations affected views of computers. In *Gender Codes*, Caroline Clarke Hayes notes "1984 marked a turning point and the start of a long and statistically significant period of decline in the proportion of women earning [Computer Science] bachelor degrees, and this decline has continued through the current day."[13] It probably isn't a coincidence that the downturn of female engagement with computing came directly on the heels of the Golden Age of video arcade games. It is likely that, through a complex sociotechnical translation dating back to pinball machines and penny arcades, the meanings of video arcade games contributed to the masculinization of computing.

The History of Video Arcade Games in the History of Technology

The case study of video arcade games supports several major historiographical claims in the history of technology. It gives particularly compelling evidence that there is considerable continuity in the history of technology. Scholars have previous argued that emergent technologies are powerfully informed by their social, technical, and economic antecedents.[14] For example, John Agar has pointed out that computers are just the latest in a series of multi-purpose machines and information systems that "framed the language

[13] Caroline Clarke Hayes. "The Incredible Shrinking Woman," in Thomas J. Misa, ed. *Gender Codes: Why Women Are Leaving Computing* (New Jersey: Jon Wiley & Sons, 2010), p. 29.
[14] Martin Campbell-Kelly and William Aspray. *Computer: A History of the Information Machine* (Boulder: Westview Press, 2nd Edition, 2004); David Alan Grier. *When Computers Were Human* (Princeton: Princeton University Press, 2005); Daniel Headrick. *When Information Came of Age: Technologies of Knowledge in the Age of Reason and Revolution, 1700-1850* (Oxford: Oxford University Press, 2000).

of what a computer was and could do."[15] Christophe Lécuyer shows similar continuity in systems of economics and innovation by drawing causal connections between the growth of early-to-mid 20th century Bay Area radio and electronics industries and the eventual development of Silicon Valley.[16] Such works indicate that the social, economic, and technical characteristics of technologies are powerfully informed by pre-existing meanings, models, and practices.

My findings lend weight to the argument that most technologies display a degree of continuity with the social and technical characteristics of previous inventions. Across all three analytical categories, my findings indicate that video arcade games were shaped by their technological antecedents to a far higher degree than is recognized in current histories. Pinball machines and other coin-op amusements provided technological models for design, placement, and use that continued (to varying degrees) in video arcade games. Concerns over pinball machines as gambling devices informed non-user understandings of video arcade games and fueled aspects of moral panic. There was a high degree of continuity between video arcade games and their technological antecedents that was important to how they were made and received.

My research also gives credence to claims about the contingency of technological development and acceptance.[17] There is a tendency, especially in journalistic histories, to treat the creation and popularity of video games as fait accompli. However, historians

[15] Jon Agar. *The Government Machine: A Revolutionary History of the Computer* (Cambridge: MIT Press, 2003), p. 3.
[16] Christophe Lécuyer. *Making Silicon Valley: Innovation and the Growth of High Tech, 1930-1970* (Cambridge: MIT Press, 2006), p. 1-3.
[17] See, for example, Atsushi Akera. *Calculating a Natural World: Scientists, Engineers, and Computers during the Rise of U.S. Cold War Research* (Cambridge: MIT Press, 2007); Thomas J. Misa. *A Nation of Steel: The Making of Modern America, 1865-1925* (Baltimore: Johns Hopkins University Press, 1995).

have shown that any given technology is deeply conditioned by a specific, contingent set of economic, political, social, and cultural conditions that resist such teleological claims.[18] As described by Philip Brey, "technological development is a contingent, heterogeneous process involving interpretation and social negotiation."[19] Scholars such as Ronald Kline and David Nye have indicated the same is true for adoption and use.[20]

The history of video arcade games demonstrates the contingency of history. The hacker ethic of the Tech Model Railroad Club encouraged the free exchange of copies of *Spacewar!* (1962) and inadvertently inspired the first two video arcade games, *The Galaxy Game* (1971) and *Computer Space* (1971).[21] The latter was implemented through the highly unusual combination of Nolan Bushnell and Ted Dabney's electrical engineering skill, computer knowledge, and coin-op amusement experience.[22] It made just enough money to provide proof of concept and fund the creation of Atari.[23] *Pong* (1972), its first successful product, was originally conceived as a mere "training exercise"

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[18] See, for example, Alison J. Clarke. *Tupperware: The Promise of Plastic in 1950s America* (Washington D.C.: Smithsonian Institute Press, 1999); David Nye. *Technology Matters: Questions to Live With* (Cambridge: MIT Press, 2006); Carroll Pursell. *The Machine in America: A Social History of Technology* (Baltimore: Johns Hopkins University Press, 1995).

[19] Philip Brey. "Philosophy of Technology Meets Social Constructivism." *Society for Philosophy and Technology.* Vol. 2, No. 3-4, Spring-Summer 1997.

[20] Ronald Kline. *Consumers in the Country: Technology and Social Change in Rural America* (Baltimore: Johns Hopkins University Press, 2000); David Nye. *Electrifying America: Social Meanings of a New Technology, 1880-1940* (Cambridge: MIT Press, 1990).

[21] Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001), p. 20-21; Henry Lowood. "Video Games in Computer Space: The Complex History of Pong." *IEEE Annals of the History of Computing*, Vol. 31, No. 3, July-September, 2009, p. 7; Steve Russell, as quoted in Kent, p. 20.

[22] Nolan Bushnell, as quoted in Morgan Ramsay. *Gamers at Work: Stories Behind the Games People Play* (New York: Apress, 2012), p. 18; Burnham, ed., p. 66; Samuel F. (Ted) Dabney. Oral history by Chris Garcia, Mountain View, California, July 16, 2012. The Computer History Museum, Mountain View, CA; Goldberg and Vendel, p. 26; Kent, p. 30;

[23] Kent, p. 38; Bill Pitts and Steve Russell. "*Galaxy Game*: the Story of the First Coin-op Video Game," California Extreme, Santa Clara, July 13, 2013.

for new employee Al Alcorn, who had only joined Atari because Ampex, his current employer, had recently run into financial trouble.[24] Either Bally or its Midway subsidiary could have opted to accept *Pong* as part of a contract fulfillment with Atari. Had they done so it might never have been manufactured, much like the three-level pinball machine "Transition" previously sold by Atari.[25] Instead, Bushnell successfully sabotaged potential deals and Atari became the first successful video arcade game manufacturer, putting it in a position to set models for design, hardware, and software. Even after video arcade games became commercial products, their success was contingent upon an influx of "new blood" mediators willing to operate them and the readiness of potential users to adopt a combined coin-op and computer technology. The development and proliferation of video arcade games were therefore highly contingent upon a particular set of individual, institutional, and cultural circumstances.

My study contributes to discussions of how technology interacts with gender. It follows in the footsteps of works such as Ruth Schwartz Cowan's *More Work for Mother* and Claude Fischer's *America Calling* that explore how certain technologies became gendered and contributed to gender dynamics.[26] This dissertation has tracked some of the ways video arcade games gained and/or perpetuated masculine characteristics due to complex set of circumstances surrounding their creation and placement. As previously discussed, my findings especially speak to studies of computing that have sought to

[24] Allan Alcorn. Oral history by Henry Lowood, Mountain View, California, April 26 and May 23, 2008. The Computer History Museum, Mountain View, CA. Al Alcorn, as quoted in Kent, p. 40-41; Bushnell, as quoted in Ramsay, p. 27; Lowood, 13.
[25] Bushnell, as quoted in Ramsay, p. 27.
[26] Ruth Schwartz Cowan. *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1983); Claude Fischer. *America Calling: A Social History of the Telephone to 1940* (Berkeley: University of California Press, 1992).

explain why computers have taken on masculine connotations.[27] Many Americans were first exposed to computers via video arcade game use, and the assumed masculinity of the technology likely contributed to public perceptions of computers in general. Similar to Regina Blaszczyk's *Imagining Consumers*, my investigation also demonstrates that both producers and mediators imagined the gender of consumers in ways that had consequences for who used video arcade games, and for what purpose.[28]

My dissertation also serves as a case study of how technology and culture continually influence each other in an act of "mutual shaping."[29] As eloquently stated by Greg Downey, "We humans make technologies, it is true, but those technologies also make us."[30] A mutual shaping of technology and culture was evident throughout the history of video arcade games. Producer designs influenced how video arcade games were used and where they could be placed by mediators, but were in turn influenced by mediator business practices and the culture of use. Technology dictated many aspects of the play, but it was equally shaped by the spatial context constructed by mediators and the social dynamics constructed by users. The economics of video arcade game were likewise mutually dependent. Successful games had to meet cultural as well as technological needs, and the industry was constrained by moral panic concerns rooted in

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[27] Janet Abbate. *Recoding Gender: Women's Changing Participation in Computer* (Cambridge: MIT Press, 2012); Jane Margolis and Allen Fischer. *Unlocking the Clubhouse: Women in Computing* (Cambridge: MIT Press, 2003); Thomas J. Misa, ed. *Gender Codes: Why Women Are Leaving Computing* (New Jersey: Jon Wiley & Sons, 2010).

[28] Regina Lee Blaszczyk. *Imagining Consumers: Design and Innovation from Wedgewood to Corning* (Baltimore: Johns Hopkins University Press, 2000).

[29] See, for example, Laura Denardis. *Protocol Politics: The Globalization of Internet Governance* (Cambridge: MIT Press, 2009); Edwards; Gitelman; John Law. "On the Social Explanation of Technical Change: The Case of Portuguese Maritime Expansion," *Technology and Culture*, Vol. 28, No. 2, 1987.

[30] Gregory J. Downey. *Closed Captioning: Subtitling, Stenography, and the Digital Convergence of Text with Television* (Baltimore: Johns Hopkins University Press, 2008), p. 10.

cultural circumstances. These findings serve as additional support for the hypothesis that technology and cultural interact in a constant evolutionary dialogue.[31] Video arcade games were neither technologically nor culturally determined, but rather defined through a complex combination of both.

The results of my dissertation also suggest new approaches to the history of technology. It particularly demonstrates that mediators deserve greater attention. Mediators influenced technological development through market feedback, and they influenced technology use through the spaces they created. It is probable that similar patterns of mediation are present in the histories of other technologies, especially consumer technologies. Ruth Schwartz Cowan hinted at this in 1987 when she included a "group of people who must distribute, market, and sell" as one of several categories of important actors in her work on the "consumption junction."[32] However, since that time only a handful of scholars have treated mediators as central technological actors. I believe this is an oversight. As argued by Josh Greenberg, mediators defined the context of the consumption junction in ways that powerfully contributed to technological meanings.[33] Andrew Hogan argued for the importance of mediators on a more individual level by stating that "mediators make decisions about what technologies should be available when and to whom; they may also choose to provide or promote certain techniques over others

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[31] For examples of the mutual shaping hypothesis, see, for example, Paul Edwards. *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge: MIT Press, 1996); Nathan Ensmenger. "Making Programming Masculine," in Misa, ed.

[32] Ruth Schwartz Cowan. "The Consumption Junction: A Proposal for Research Strategies in the Sociology of Technology," in Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch, eds. *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge: MIT Press, 1987), p. 254.

[33] Joshua M. Greenberg. *From Betamax to Blockbuster: Video Stores and the Invention of Movies on Video* (Cambridge: MIT Press, 2008), p. 155.

for a variety of personal, professional, and experiential reasons."[34] The "mediation junction," as described by Oldenziel et al., reveals technological choices that are historically important, and the field would benefit from giving it careful attention.[35]

Finally, my dissertation suggests that a multiscalar, multi-actor group approach is necessary to uncover aspects of the history of technology. Multiple viewpoints and levels of analysis allow for a robust triangulation of historical events and conditions. In the case of video arcade games, some elements only become clear when viewing producers, mediators, and users together. Circumstances such as the dynamics of video arcade games spaces, the forces influencing technological development, and the impact of moral panic only take shape from the combined perspective of all three analytical categories.[36] Of course, historical narrative is constrained by source material, and it isn't always possible to do a multiscalar and/or multi-actor group analysis. That being said, when opportunities present themselves it would behoove historians of technology to take advantage. The more perspectives we can investigate and integrate into our narratives, the better we will be able to accurately represent the past.

[34] Andrew J. Hogan. "Set Adrift in the Prenatal Diagnostic Marketplace: Analyzing the Role of Users and Mediators in the History of a Medical Technology," *Technology & Culture*, Vol. 54, No. 1, 2013, p. 62.
[35] Ruth Oldenziel, Adri Albert de la Bruhèze, and Onno de Wit. "Europe's Mediation Junction: Technology and Consumer Society in the 20th Century." *History and Technology: An International Journal*, Vol. 21, No. 1, 2006
[36] Indeed, this work breaks new ground because of it adopts a multifaceted approach, in contrast with the vast majority of video arcade games histories that present a narrow focus on producers.

Bibliography

Archival Sources

Al Alcorn Papers. Stanford University Special Collections, Stanford University Libraries, Stanford, CA.

Atari, Inc. Business Plans, 1974-1975. Stanford University Special Collections, Stanford University Libraries, Stanford, CA.

Early Arcade Video Games, 1971-1978. The International Center for the History of Electronic Games, the Strong Museum of Play, Rochester, NY.

Golden Age Arcade Video Games, 1978-1985. The International Center for the History of Electronic Games, the Strong Museum of Play, Rochester, NY.

Kevin Gifford Video Game Magazine Collection, 1970s-present. The International Center for the History of Electronic Games, the Strong Museum of Play, Rochester, NY.

Play Meter and *RePlay* Collection. The International Center for the History of Electronic Games, the Strong Museum of Play, Rochester, NY.

Steve Bristow Papers. Stanford University Special Collections, Stanford University Libraries, Stanford, CA.

"Video Players: Photographs of Ira Nowinski, 1982." Stanford University Special Collections, Stanford University Libraries, Stanford, CA.

Oral Histories, Interviews, and Autobiographies

Adlum, Ed. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

Alcorn, Allan. Oral history by Henry Lowood, Mountain View, California, April 26 and May 23, 2008. The Computer History Museum, Mountain View, CA.

_____. "First-Hand: The Development of Pong: Early Days of Atari and the Video Game Industry." IEEE Global History Network: http://ieeeghn.org/wiki6/index.php/First-Hand:The_Development_of_Pong:_Early_Days_of_Atari_and_the_Video_Game_Industry (accessed 5/28/15).

_____. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

Baer, Ralph H. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

_____. *Videogames in the Beginning* (Springfield, NJ: Rolenta Press, 2005).

Bailey, Dona. Interview by Leigh Alexander. "The Original Gaming Bug: *Centipede* Creator Dona Bailey," *Gamasutra*, August 27, 2007. http://www.gamasutra.com/view/feature/130082/the_original_gaming_bug_centipede_.php (accessed 4/1/15).

Bushnell, Nolan. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

_____. Interview by Morgan Ramsay. *Gamers at Work: Stories Behind the Games People Play* (New York: Apress, 2012).

Dabney, Samuel F. (Ted). Oral history by Chris Garcia, Mountain View, California, July 16, 2012. The Computer History Museum, Mountain View, CA.

Fischbach, Greg. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

Graetz, J.M. "The Origin of *Spacewar!*" in Van Burnham, ed. *Supercade: A Visual history of the Videogame Age, 1971-1984* (Cambridge: MIT Press, 2001).

Hochberg, Joel. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

Iwatani Toru. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

Kassar, Ray. Interview by Triston Donovan. "The Replay Interviews: Ray Kassar," *Gamasutra*, April 29, 2011. http://www.gamasutra.com/view/feature/134733/the_replay_interviews_ray_kassar.php (accessed 12/1/14).

_____. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

Katz, Arnie. Interview by Steve Fulton. "Electronic Games: the Arnie Katz Interview," *Gamasutra*, December 28, 2009. http://www.gamasutra.com/view/feature/132614/electronic_games_the_arnie_katz_.php?page=1 (accessed November 6, 2012)

Kauffman, Pete. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

Kunkel, Bill. *Confessions of the Game Doctor* (Springfield, NJ: Rolenta Press, 2005).

_____. Interview by Frank Cifaldi. "Playing Catch-up: Bill 'the Game Doctor' Kunkel Lets Loose," *Gamasutra*, December 12, 2005. http://www.gamasutra.com/php-bin/news_index.php?story=7481#.UJk0-cXAdkI (accessed November 12, 2012).

_____. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

Miller, Alan. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

Pitts, Bill and Russell, Steve. "*Galaxy Game*: the Story of the First Coin-op Video Game," California Extreme, Santa Clara, July 13, 2013.

Pitts, Bill. “Bill Pitts, ’68: Creator of the *Galaxy Game*.” https://alumni.stanford.edu/get/page/magazine/article/?article_id=53338 (accessed 11/10/14).
_____. “The Galaxy Game,” Computer History Exhibits, Stanford University, October 29, 1997. http://infolab.stanford.edu/pub/voy/museum/galaxy.html (accessed 11/10/14).
Race, Steven. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).
Russell, Steve. Oral history by Al Kossow, Mountain View, California, August 9, 2008. The Computer History Museum, Mountain View, CA.
_____. in Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).
Rotberg, Ed. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).
Shaw, Carol. Interview by Tracey Lien. “No Girls Allowed,” *Polygon*, December 2, 2013. http://www.polygon.com/features/2013/12/2/5143856/no-girls-allowed (accessed 4/1/15).
Valentine, Donald T. Oral history by Sally Smith Hughes, Regional Oral History Office, The Bancroft Library, University of California, Berkeley, October 20, 2009.
Weisbaum, Herb. Interview by Stephen L. Kent. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).

Online Image Resources

The Arcade Flyer Archive. The International Arcade Museum. http://flyers.arcade-museum.com/
The C. Everett Koop Papers. National Library of Medicine. http://profiles.nlm.nih.gov/QQ/
The Computer History Museum. http://www.computerhistory.org/
The International Arcade Museum. http://www.arcade-museum.com/
The Jack Kirby Museum. http://kirbymuseum.org/
The Museum of the City of New York. http://www.mcny.org/
New York City Department of Records. http://www.nyc.gov/html/records/html/home/home.shtml
Replay Amusement Museum. http://www.replaymuseum.org/
The Sands Mechanical Museum. http://www.sandsmuseum.com/
Time Magazine. http://time.com/
Wikipedia Commons. https://commons.wikimedia.org

Books and Articles

"Surgeon General Sees Danger in Video Games," *New York Times*, November 10, 1982. http://www.nytimes.com/1982/11/10/us/around-the-nation-surgeon-general-sees-danger-in-video-games.html (accessed 5/28/15)

Adams, Roe R. III. "Come Cast a Spell with Me," *Computer Gaming World*, Vol. 5, No. 4, September-October 1985.

Abbate, Janet. *Inventing the Internet* (Cambridge: MIT Press, 1999).

_____. *Recoding Gender: Women's Changing Participation in Computer* (Cambridge: MIT Press, 2012).

Agar, Jon. *The Government Machine: A Revolutionary History of the Computer* (Cambridge: MIT Press, 2003).

Akera Atsushi. *Calculating a Natural World: Scientists, Engineers, and Computers during the Rise of U.S. Cold War Research* (Cambridge: MIT Press, 2007).

Albin, Len. *Secrets of the Video Game Superstars* (New York: Avon Books, 1982).

Aspray, William and Ceruzzi, Paul E, eds. *The Internet and American Business* (Cambridge: MIT Press, 2008).

Baker, Mark. *I Hate Videots: Today the Arcade, Tomorrow the World* (New York: Simon and Schuster, 1982).

Barton, Matt. *Dungeons & Desktops: The History of Computer Role-Playing Games* (Boca Raton: CRC Press, 2008)

Beamer, Charles. *Video Fever* (Nashville: Thomas Nelson Publishers, 1982).

Benson, Susan. *Counter Cultures: Saleswomen, Managers, and Customers in American Department Stores, 1890-1940* (Champaign: University of Illinois Press, 1988)

Blanchet, Michael. *How to Beat the Video Games* (New York: Simon & Schuster, 1982).

Blaszczyk, Regina Lee. *Imagining Consumers: Design and Innovation from Wedgewood to Corning* (Baltimore: Johns Hopkins University Press, 2000).

Bloom, Steve. *Video Invaders* (New York: Arco Publishing, Inc., 1982).

Brey, Philip. "Philosophy of Technology Meets Social Constructivism," *Society for Philosophy and Technology*, Vol. 2, No. 3-4, Spring-Summer 1997.

Bunton, Dan. "Real World Gaming." *Computer Gaming World*, Vol. 2, No. 5, September –October 1982.

Burnham, Van, ed. *Supercade: A Visual history of the Videogame Age, 1971-1984* (Cambridge: MIT Press, 2001).

Campbell-Kelly, Martin. *From Airline Reservations to Sonic the Hedgehog: A History of the Software Industry* (Cambridge: MIT Press, 2003).

Campbell-Kelly, Martin and Aspray, William. *Computer: A History of the Information Machine* (Boulder: Westview Press, 2nd Edition, 2004).

Ceruzzi, Paul. *A History of Modern Computing* (Cambridge: MIT Press, 1998).

The Casino Control Commission. "In the Matters of the Application of Bally's Park Place, Inc., a New Jersey Corporation, for a Casino License and the Application of Bally Manufacturing Corporation, a Delaware Corporation, for a Casino Service Industry License," March 16, 1981. http://njlegallib.rutgers.edu/legallib/njar/v10/p0356.pdf

Clarke, Alison J. *Tupperware: The Promise of Plastic in 1950s America* (Washington D.C.: Smithsonian Institute Press, 1999).
Cohen, Scott. *Zap! The Rise and Fall of Atari* (New York: McGraw-Hill, 1984).
Cohen, Stanley. *Folk Devils and Moral Panics* (New York: Taylor & Francis, 2011).
Collins, Karen. *Game Sound: An Introduction to the History, Theory, and Practice of Video Game Music and Sound Design* (Cambridge: MIT Press, 2008).
_____. "One-Bit Wonders: Video Game Sound before the Crash," in Mark J.P. Wolf, ed. *Before the Crash: Early Video Game History* (Detriot: Wayne State University Press, 2012).
Cowan, Ruth Schwartz. "The Consumption Junction: A Proposal for Research Strategies in the Sociology of Technology," in Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch, eds. *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge: MIT Press, 1987)
_____. *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1985).
Craven, Robert R. *Billiards, Bowling, Table Tennis, Pinball, and Video Games: a Bibliographic Guide* (Westport: Greenwood Press, 1983).
Cravenson, C.F. "Video Games for the 'Basest Instincts of Man,'" *The New York Times*, January 28, 1982.
Denardis, Laura. *Protocol Politics: The Globalization of Internet Governance* (Cambridge: MIT Press, 2009)
Douglas, Susan. Susan Douglas. *Inventing American Broadcasting, 1899-1922* (Baltimore: Johns Hopkins University Press, 1989).
_____. *Listening In: Radio and the American Imagination* (New York: Times Books, 1999).
Downey, Gregory J. *Closed Captioning: Subtitling, Stenography, and the Digital Convergence of Text with Television* (Baltimore: Johns Hopkins University Press, 2008).
Dubren, Ron. *The Video Master's Guide to Centipede* (New York: Bantam Books, 1982).
Edwards, Paul. *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge: MIT Press, 1996).
_____. "Infrastructure and Modernity: Force, Time, and Social Organization in the History of Sociotechnical Systems," in Thomas J. Misa, Philip Brey, and Andrew Feenberg, eds. *Modernity and Technology* (Cambridge: MIT Press, 2004).
Ensmenger, Nathan. *The Computer Boys Take Over: Computers, Programmers, and the Politics of Technical Expertise* (Cambridge: MIT Press, 2010).
_____. "Making Programming Masculine," in in Thomas J. Misa, ed. *Gender Codes: Why Women Are Leaving Computing* (New Jersey: Jon Wiley & Sons, 2010).
Fischer, Claude. *America Calling: A Social History of the Telephone to 1940* (Berkeley: University of California Press, 1992).
Fourie, Pieter Jacobus. *Media Studies: Institutions, Theories, and Issues* (Lansdowne, South Africa: Juta and Company Ltd., 2001).

Geist, William E. “The Battle for America’s Youth,” *New York Times*, January 5, 1982. http://www.nytimes.com/1982/01/05/nyregion/the-battle-for-america-s-youth.html (accessed 4/29/15)
Gitelmen, Lisa. *Scripts, Grooves, and Writing Machines: Representing Technology in the Edison Era* (Stanford: Stanford University Press, 1999).
Goldberg, Marty and Vendel, Curt. *Atari, Inc.: Business is Fun* (Carmel: Syzygy Company Press, 2012).
Goldberg, Morton David. *Software Protection and Marketing: Computer Programs and Data Bases; Video Games and Motion Pictures, Vol. 1* (New York: Practicing Law Institute, 1983).
Graham, Margaret B.W. “Technology and Innovation,” in Geoffrey Jones and Jonathan Zeitlin, eds. *The Oxford Handbook of Business History* (Oxford: Oxford University Press, 2007).
Greenberg, Joshua M. *From Betamax to Blockbuster: Video Stores and the Invention of Movies on Video* (Cambridge: MIT Press, 2008).
Grier, David Alan. *When Computers Were Human* (Princeton: Princeton University Press, 2005).
Guins, Raiford. *Game After: A Cultural Study of Video Game Afterlife* (Cambridge: MIT Press, 2014).
Haddon, Leslie. “The Development of Interactive Games,” in Hugh Mackay and Tim O’Sullivan, eds. *The Media Reader: Continuity and Transformation* (London: SAGE Publications, 1999)
Haring, Kristen. *Ham Radio’s Technical Culture* (Cambridge: MIT Press, 2007)
Hast, Adele. *International Directory of Company Histories, Vol. 3* (Chicago: St. James Press, 1991).
Hayes, Caroline Clarke. “The Incredible Shrinking Woman,” in Thomas J. Misa, ed. *Gender Codes: Why Women Are Leaving Computing* (New Jersey: Jon Wiley & Sons, 2010).
Headrick, Daniel. *When Information Came of Age: Technologies of Knowledge in the Age of Reason and Revolution, 1700-1850* (Oxford: Oxford University Press, 2000).
Hirschfeld, Tom. *How to Master the Video Games* (New York: Bantam Books, 1981).
Hogan, Andrew J. “Set Adrift in the Prenatal Diagnostic Marketplace: Analyzing the Role of Users and Mediators in the History of a Medical Technology,” *Technology & Culture*, Vol. 54, No. 1, 2013.
Hughes, Thomas P. *Networks of Power: Electrification in Western Society 1880-1930* (Baltimore: Johns Hopkins University Press, 1983).
_____. “Technological Momentum,” in Merritt Roe Smith and Leo Marx, eds. *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge: MIT Press, 1994.
Huhtamo, Erkki. “Slots of Fun, Slots of Trouble: An Archaeology of Arcade Gaming,” in Joost Raessens and Jeffrey Goldstein, eds. *Handbook of Computer Game Studies* (Cambridge: MIT Press, 2005).
Isaacson, Walter. *Steve Jobs* (New York: Simon & Schuster, 2013).

Jaffe, Martin. *Regulating Video Games* (Chicago: American Planning Association, 1982).
Jones, Steven E. and Thiruvathukal, George K. *Codename Revolution: The Nintendo Wii Platform* (Cambridge: MIT Press, 2012).
Kando, Tom. "Popular Culture and its Sociology: Two Controversies." *The Journal of Popular Culture*, Vol. 9, No. 2, 1975.
Kent, Stephen L. *The Ultimate History of Video Games: From Pong to Pokemon and Beyond – The Story Behind the Craze That Touched Our Lives and Changed the World* (New York: Three Rivers Press, 2001).
Kline, Ronald. *Consumers in the Country: Technology and Social Change in Rural America* (Baltimore: Johns Hopkins University Press, 2000).
Kocurek, Carly A. "Coin-Drop Capitalism: Economic Lessons from the Video Game Arcade," in Mark J.P. Wolf, ed. *Before the Crash: Early Video Game History* (Detroit: Wayne State University Press, 2012).
Kohl, Louise ed. *Computer Entertainment*, Vol. 3, No. 7, July 1985.
Kubey, Craig. *The Winners' Book of Video Games* (New York: Warner Books, 1982).
Laird, Pamela Walker. *Advertising Progress: American Business and the Rise of Consumer Marketing* (Baltimore: Johns Hopkins University Press, 1998).
Law, John. "On the Social Explanation of Technical Change: The Case of Portuguese Maritime Expansion," *Technology and Culture*, Vol. 28, No. 2, 1987.
Law, John and Singleton, Vicky. "Performing Technology's Stories: On Social Constructivism, Performance, and Performativity," *Technology and Culture.* Vol. 41, No. 4, 2000.
Lécuyer, Christophe. *Making Silicon Valley: Innovation and the Growth of High Tech, 1930-1970* (Cambridge: MIT Press, 2006).
Loftus, Geoffrey R. and Loftus, Elizabeth F. *Mind at Play: The Psychology of Video Games* (New York: Basic Books, 1983).
Lowood, Henry. "Videogames in Computer Space: the Complex History of Pong." *IEEE Annals of the History of Computing*, Vol. 31, No. 3, 2009.
Mahoney, Michael S. "What Makes the History of Software Hard," *IEEE Annals of the History of Computing*, Vol. 30, No. 3, July-September 2008, p. 9.
Malliet , Steven, and de Meyer, Gust. "The History of the Video Game," in Joost Raessens and Jeffrey Goldstein, eds. *Handbook of Computer Game Studies* (Cambridge: MIT Press, 2005).
Marfels, Christian. *Bally: The World's Game Maker* (Las Vegas: UNLV International Gaming Institute, 1998).
Margolis, Jane and Fischer, Allen. *Unlocking the Clubhouse: Women in Computing* (Cambridge: MIT Press, 2003).
Martin, Douglas. "Ralph H. Baer, Inventor of First System for Home Video Games, Is Dead at 92," *The New York Times*, December 7, 2014. http://www.nytimes.com/2014/12/08/business/ralph-h-baer-dies-inventor-of-odyssey-first-system-for-home-video-games.html?_r=0 (accessed 8/4/15)
Mayhem, Major. *The Complete Video Warrior: How to Beat the Video Games* (New York: Golden Press, 1982).

Misa, Thomas J., ed. *Gender Codes: Why Women Are Leaving Computing* (New Jersey: Jon Wiley & Sons, 2010).
_____. *A Nation of Steel: The Making of Modern America, 1865-1925* (Baltimore: Johns Hopkins University Press, 1995).
Montfort, Nick and Bogost, Ian. *Racing the Beam: The Atari Video Computer System* (Cambridge: MIT Press, 2009).
Myers, David. "Atari: Exploiting the Human Connection," *Computer Gaming World*, Vol. 2, No. 5, September-October 1982.
Nasaw, David. *Going Out: The Rise and Fall of Public Amusements* (New York: Basic Books, 1993).
Norberg, Arthur L. and O'Neill, Judy. *Transforming Computer Technology: Information Processing for the Pentagon, 1962-1986* (Baltimore: Johns Hopkins University Press, 1996)
Nye, David. *Electrifying America: Social Meanings of a New Technology, 1880-1940* (Cambridge: MIT Press, 1990).
_____. *Technology Matters: Questions to Live With* (Cambridge: MIT Press, 2006).
Oldenziel, Ruth, de la Bruhèze, Adri Albert, and de Wit, Onno. "Europe's Mediation Junction: Technology and Consumer Society in the 20th Century." *History and Technology: An International Journal*, Vol. 21, No. 1, 2006.
Oudshoorn, Nelly and Pinch, Trevor, eds. *How Users Matter: The Co-Construction of Users and Technology* (Cambridge: MIT Press, 2003).
Pursell, Carroll. *The Machine in America: A Social History of Technology* (Baltimore: Johns Hopkins University Press, 1995).
Raessens, Joost and Jeffrey Goldstein, Jeffrey, eds. *Handbook of Computer Game Studies* (Cambridge: MIT Press, 2005).
Ramsay, Morgan. *Gamers at Work: Stories Behind the Games People Play* (New York: Apress, 2012).
Rubin, Michael, ed. *Defending the Galaxy: The Complete Handbook of Videogaming* (Gainesville: Triad Publishing Company, 1982).
Ruggill, Judd Ethan and McAllister, Ken S. *Gaming Matters: Art, Science, Magic, and the Computer Game Medium* (Tuscaloosa: The University of Alabama Press, 2011).
Saxenian, AnnaLee. *Regional Advantage: Culture and Competition in Silicon Valley and Route 128* (Cambridge: Harvard University Press, 1996).
Schüll, Natasha Dow. *Addiction by Design: Machine Gambling in Las Vegas* (Princeton: Princeton University Press, 2012).
Scranton, Philip. *Endless Novelty: Specialty Production and American Industrialization, 1865-1925* (Princeton: Princeton University Press, 1997).
Segrave, Kerry. *Vending Machines: An American Social History* (Jefferson: McFarland & Co., 2002).
Sito, Tom. *Moving Innovation: A History of Computer Animation* (Cambridge: MIT Press, 2013).
Skelly, Tim. "The Rise and Fall of Cinematronics," in Mark J.P. Wolf, ed. *Before the Crash: Early Video Game History* (Detroit: Wayne State University Press, 2012).

Suisman, David. *Selling Sounds: The Commercial Revolution in American Music* (Cambridge: Harvard University Press, 2009).
Sykora, Jim and Birkner, John. *The Video Master's Guide to* Pac-Man (New York: Bantam Books, 1982).
Uston, Ken. *Score! Beating the Top 16 Video Games* (New York: New American Library, 1982).
Watson, James and Hill, Annie. *Dictionary of Media and Communication Studies, 8th Ed.* (New York: Bloomsbury, 2012)
Winner, Langdon. *The Whale and the Reactor: A Search for Limits in an Age of High Technology* (Chicago: University of Chicago Press, 1986).
Wolf, Mark J.P., ed. *B*efore *the Crash: Early Video Game History* (Detroit: Wayne State University Press, 2012.
_____. "Introduction," in Mark J.P. Wolf, ed. *Before the Crash: Early Video Game History* (Detroit: Wayne State University Press, 2012).
_____. "The Video Game Industry Crash of 1977," in Mark J.P. Wolf, ed. *Before the Crash: Early Video Game History* (Detroit: Wayne State University Press, 2012).
Wyatt, Sally. "Non-Users also Matter: The Construction of Users and Non-Users of the Internet," in Nelly Oudshoorn and Trevor Pinch, eds. *How Users Matter: The Co-Construction of Users and Technology* (Cambridge: MIT Press, 2003).
Yannick Lejacq. "How a Photographer Recovered the Seedy Glory Days of Times Square Arcades." *Kill Screen*, May 25, 2012. http://killscreendaily.com/articles/how-eight-year-old-photographer-captured-seedy-glory-days-times-square-arcades-1983/ (accessed 5/22/15).
Yates, JoAnne. *Structuring the Information Age: Life insurance and Technology in the Twentieth Century* (Baltimore: Johns Hopkins University Press, 2005).
Yost, Jeffery R. *The Computer Industry* (Westport: Greenwood Press, 2005).
Zunz, Olivier. *Making America Corporate, 1870-1920* (Chicago: University of Chicago Press, 1990).