COMPUTERS FOR THE MASSES: THE AMERICAN SOCIO-TECHNOLOGICAL CHANGE OF THE 1970'S AND 1980'S.

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ABSTRACT

Computers for the Masses: The American Socio-technological Change of the 1970's and 1980's

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This thesis developed out of my personal curiosity on the subject of high-technological development. Specifically, high-technology's shift from primarily a military tool to a consumer product raised several questions to answer since first taking an interest in the subject. My lifestyle, like many other Americans in my generation, incorporates computers, cell-phones, and video game consoles as not only an innovative tool, but a standard and necessary mode of production. In our contemporary society, technology is obtainable everywhere. As an entertaining tool in the form of video games to a productivity tool in our workplaces, most individuals have assimilated consumer electronics. Yet this essay seeks to look at the beginning of these changes in the late 1970's and 1980's. Particularly, how did an American society that based itself around industrial mechanisms suddenly become so enthralled by consumer electronics, which a decade before were used for missile guidance and complex mathematical calculations? How did these devices, which were initially proposed as an industrial and political efficiency tool, suddenly become a labeled consumer luxury good? The answer to these questions surprisingly developed into a more complex socioeconomic analysis of 1970's and 1980's behaviors that utilized a Marxist interpretation of the relationship between technology and the human experience. This topic incorporates terms and theories from a variety of academic subjects. While this essay is formed around a historical narrative and argument, much of the evidence is acquired from economical, sociological, and psychological resources. As a

result, I hope readers of this essay will find it as enlightening and enjoyable as my own personal journey within the subject.

Keywords: Semiconductors, Consumer Electronics, 1970's, 1980's, Marx, Base and Superstructure, Computers, Apple, Commodore, Atari, Innovation, Marketing, New Wave, Narcissism, Materialism, Consumerism, Recession, Price/Value, Material Consciousness, United States of America

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Introduction

While reminiscing on ideal American cultural stereotypes of the 1980's, many individuals imagine a society of fast cars, fast money, and fast technology. Materialistic, egocentric, and gluttonous were just some of the adjectives to describe the American cultural and social attitudes in this era. The Music Television Channel (MTV) had put on its first music video titled "Video had Killed the Radio Star" while simultaneously promoting New Wave electronic arrangements that dealt with issues of love, break-ups, and wealth.[1] The Austrian immigrant Arnold Schwarzenegger played the role of a fictional killing machine that excited a nation with his muscular perfection. Apple Computers and International Business Machines Corporation were producing new personal computers that were advertised as breakthrough. The stock market became the representation of a "greed is good" mentality amongst American business leaders and prospectors.[2] However, in comparison to the previous two decades, the 1980's represented a complete reversal of conventional American values. There is no question that the 1960's American philosophical embraces of anti-materialism and civil rights strongly differed from the overall values of consumerism and patriotic fervor that so often described the 1980's. While many researchers attribute these qualities to the development of Reaganesque political idealism or a counter-revolution to 1960's and 70's civil activism, there is a much deeper, underlying cause to this American cultural transformation.

This essay proposes that American values established in the 1980's were very much related to the developing 1970's high-tech industry that promoted the consumption of personal,

[1] Robert Hilburn (1981, August 4). "Music TV: Hope Rocks Fort Lee Music TV Bows," Los Angeles Times (1886-Current File),p. G1. ProQuest Historical Newspapers Los Angeles Times (1881 - 1986) database. (Retrieved November 26, 2008).

[2] Stanley Weiser and Oliver Stone, *Wall Street*, DVD, Directed by Oliver Stone (1987, New York, NY: Amercent Films, 2007).

yet unnecessary, innovative technologies. As a result, the mass consumerism and product materialism seen in the 1980's was related to the technological developments in the 1970's. These developments could never have occurred without a combination of economic circumstance and innovative technology. Because novel technology enhanced certain methods of production, American beliefs into certain economic, political, and social identities also transformed.

This essay will first analyze the initial transformations seen in the economic trade structure affecting the semiconductor market. The competitive forces seen within the highly volatile semiconductor industry ultimately drove down internal component prices significantly enough to encourage growth in the consumer technology industry. I will additionally explore the impact that the 1974, 1977, and 1982 semiconductor recessions had on opening new markets and businesses in the United States. By doing so, I will add onto previously adapted arguments that government investment and 1960's philosophical inventiveness initiated the developments in the consumer technology sector. This proposed economically inclined explanation will be employed thoroughly within an American technological history narrative. For this conversation to occur, this essay will look at the established research and historiography of the subject.

The essay's second goal is to illustrate the transformations seen in 1970's and 1980's consumer technology and its effects on the American human experience in the workplace, the entertainment industry, and the arts. The second portion of the essay will analyze the significant American consumer desire to purchase innovative products, such as early videogames, cell phones, personal computers, and music players. These devices initiated a broad socioeconomic change in American attitudes towards mass consumerism. These perspectives are reflected in the movies, music, and social opinions of the 1980's era. Additionally, this portion of the essay will

reveal some unintended consequences that technological business marketing had within American society; specifically, whether technological inclined businesses exploited mass culture by marketing products that represented artificial needs. These ideas are important to confirm that the acceptance of new consumer technologies ultimately impacted American values in late 1970's and 1980's America.

The third segment of this essay implements socioeconomic perspectives of the American transformations seen in this era. While Karl Marx's base and superstructure theory is implemented by many scholars to explain the social consequences of such new devices as the printing press and the steam-mill, the theory is additionally useful in analyzing the cultural and social transformations seen in the 1970s and 1980s.[3] My central argument in this essay implements Marx's theory to explain how 1970's technology influenced many of the 1980's American behavioral changes. The incorporation of such high-technology within the domestic, education, and economic institutions, transformed the social behaviors of the American community. As a result, the successful introduction of personal high-technology eventually challenged the conventional American superstructure of the 1980's.

By using the 1970's and 1980's decades as specific examples, I hope to restart the conversation that Marx's base and superstructure theory transcends his own time-period. By revealing the primary cause of consumer appeal of new technologies, I hope to justify the Marxist rhetoric that changes in technology influence the cultural values of a specific society, and that such changes are derived from changes in the economic production base. By doing so,

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[3] Karl Marx and Friedrich Engels, *The German Ideology* (London, 1942), 18. Robert L. Heilbroner, "Do Machines Make History?," in *Does Technology Drive History?* Eds. Leo Marx and Merritt Roe Smith (Cambridge: The MIT Press, 1994), 59. Marx's *The German Ideology* provides the introduction to the base and superstructure theory that drives support for technological determination. Essentially, a change in use of technology, changes the entire cultural values and experiences of a society.

we can add a more pragmatic explanation for the cultural class disparities between Americans living in the 1980's.

Chapter 1: Various Theories Behind the 1970's and 1980's Personal High-Tech Explosion

The phenomenal growth within the personal technology sector during the 1970's was already addressed by numerous scholars of the history of technology and society sub-discipline.[4] Yet their ideas are vastly different toward the cause of such a surge of personal electronic production during this era. In particular, there were two major causation discussions on the underlying question of what created the 1970's consumer electronic mass production. The first of these dialogues focused on American government spending within the military industrial complex and educational institutions decades before the 1970's. During and after the Second World War, the United States government spent billions on research and development within the military. These investments into atomic bombs, missile guidance systems, jet engines, and space vehicles eventually created a highly developed semiconductor industry in the United States. These semiconductors were the foundation for computer systems, cell phones, and video games consoles in the 1970's. The second argument largely focused on the individual innovators that invented and designed the personal electronics of the 1970's and 1980's. Much of this theory is based on the idea that 1960's counterculture idealism transcended into 1970's consumer electronic designs. There was no doubt that such globally minded, young liberal thinkers could utilize technology to mold the world into their own vision. While these two opinions hold some truth, there could be a possible third argument that points to the creation of such technology in the 1970's and 1980's.

Some scholars argued that early technological development was related to political government expenditure and investment. Gabrielle Hect and Paul Edwards, in their book *The*

[4] The usage of the term personal electronics relates to any consumer electronic device that incorporated transistors or other semiconductors for functionality. These products such as video game consoles, calculators, computers, and cell-phones, are the basis for this language throughout the essay.

Technopolitics of Cold War, argued that technology and politics are uniquely related. In Hect's and Edward's book, technopolitics is defined as "the strategic practice of designing or using technology to enact political goals."[5] Arguably, this type of political and high-technology relationship began in World War II.[6] In the 1940's, the United States spent billions on a defense industry to win a global war that spanned two oceans. However, World War II had the beneficial consequence of developing innovations that required complex formulas by scientists and war room strategists. The first "contemporary" computer was born in the laboratories of scientists trying to create a machine that would compute more efficiently than an individual human.[7] The formulas that went into the computers calculated the amount of destruction that firebombing could have on an attacked area. Robert McNamara, American Secretary of Defense from 1961 to 1968, particularly favored this type of formulaic research to achieve the best results in bombing campaigns during both World War II and the Vietnam War. The formula for bomber efficiency was effectively placed into a rudimentary computer for maximum approaches for destruction and death.[8] This type of demand for efficient means of destruction during war time eventually created technopolitical idealism within the American military complex. The beginning of government investment into the defense industry allowed for high technology concepts to develop. Yet, the alliance between the defense industry and government institutions did not end when World War II concluded.

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[5] Gabrielle Hect and Paul Edwards, *The Technopolitics of Cold War: Toward a Transregional Perspective*, (Washington, District of Columbia: American Historical Association, 2007), 4.

[6] Defensive production and political developments have always had a relationship. However, World War II represents the first time where high-technology was used in a wartime era. While World War I's industrial technology had more to do with mechanical engineering, internal components that were implemented in computers were not utilized.

[7] Indeed before World War II, computers were not machine, but human. Any individual that calculated formulaic equations or accounting lists was called a human computer.

[8] Errol Morris, *Fog of War*, DVD, Directed by Errol Morris, (Berlin, Sony Pictures Classic, 2003). This movie was an overview of McNamara's life through various interviews with Robert McNamara. The movie gives insight to McNamara's demand for efficiency within the technology they were developing.

This relationship between government and technological innovation strengthened further in the post-World War II era. The 1950's and 1960's government investment into the defense industry particularly created scientific competition and research that dawned the beginning of unprecedented use of large computers, semiconductors, and satellites. The creation of the nuclear missile technology created a scenario where additional devices were needed that incorporated the internal component. Furthermore, once missile technology became available, the usage of the airplane as a nuclear conveying system became obsolete. Instead, nuclear missiles needed guidance, tracking, and communication computer systems that depended upon the usage of transistor internal components.[9] With the missiles themselves becoming equipped with guidance systems, satellites were needed for tracking and espionage. Vacuum tubes and other internal components were needed to transport such information within a computer toward the satellite tracking systems. As a result, the 1950's and 1960's saw a significant investment into faster vacuum tubes and internal components in the United States.[10] As the Cold War between the Soviet Union and the United States escalated during these eras, more semiconductor companies such as Raytheon Industries were developed in order to accompany government demand for efficient destruction and espionage tools. In addition, electronic mechanical industries such as IBM grew exponentially during this time of increased defense related spending.[11] The growth of American and Soviet missile stockpiles increased the need for American innovative technology to compete with Soviet advances in science. The competition in space exploration also invited innovative companies to grab government contracts. These technologies however were

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[9] Hect and Edwards, 4.

[10] Ibid.

[11] Steven W. Usselman, "Learning the Hard Way: IBM and the Sources of Innovation in Early Computing," in *Financing Innovation in the United States 1970 to Present*, eds. Naomi R. Lamoreaux and Kenneth L. Sokoloff (Cambridge: MIT Press, 2007), 341-342.

completely monopolized and operated by government institutions. The technology that drove missiles and satellites was still not practical or inexpensive enough to sufficiently reach the consumer masses.[12] There is no doubt that some of the circumstances that developed an economically strong and competitive semiconductor industry came from governmental technopolitics. The interrelationship between government spending and innovative high-tech tools unquestionably created the basic research for the creation of future personal electronics that were seen in the 1970's.

Yet none of this technology could have been possible without the research from educational facilities located outside the military complex. As early as the 1930's, universities led in the research of devices that incorporated semiconductors and vacuum tubes. More importantly, universities provided an excellent source of venture capitalism for flocking researchers and inventors. California's Silicon Valley, Route 128 of the Massachusetts Technology Corridor, and the Carolina Technology Triangle were the best examples of a highly technological area grown from university investment. These areas benefited directly from the research efforts at Massachusetts Institute of Technology (MIT), Harvard University, Stanford University, and the University of North Carolina.[13] These schools funded venture engineering projects to promote a viable economic community dependant on university sponsored business. As a result, businesses and researchers created a unique relationship that stimulated innovative technologies while increasing economic success.

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[12] Mark Kurlansky, *1968: The Year that Rocked the World* (New York: Random House Trade Paperbacks, 2005), 42. Beginning in 1965, news studios used satellites to convey live events to television viewers. While this might represent some use of the technology as a consumer product, the actual use of the semiconductors came from industry and not the individual.

[13] Sucheng Chan and Spencer Olin, eds., "The Rise of Information Capitalism" in *Major Problems in California History* (Boston: Houghton Mifflin Company, 1997), 392

Stanford University proved specifically influential in providing investment to industrial innovation. In 1937, seeing the possibility for community growth through technological research, Stanford Engineering Professor Frederick Terman petitioned the school to create a stronger bond between the school's student population and the surrounding businesses. Two students specifically, William Hewlett and David Packard particularly gave Terman the examples he needed for University funding for a business venture. Hewlett and Packard, the eventual founders of the contemporary Hewlett-Packard Company, designed an audio-oscillator from Stanford University research. Stanford also provided funding for the device and garnered a share of its sales. The audio-oscillator detected submarine radio signals and became a crucial technology for tracking Japanese ships during World War II.[14] Additionally, brothers Sigurd and Russell Varian created radar systems to identify enemy submarines and aircrafts; also the result of research funding given by Stanford University.[15] While Stanford University funded these products for the purpose of reselling the technology to the defense industry, the institution still managed to advance technological progress and create an initial community of engineers in the surrounding area. Therefore, the relationship between educational institutions and entrepreneurs created an environment of innovation, research, and prosperity.

Yet investment into engineering business ventures was not the only method in which universities attempted to build a technologically motivated community. Spurred by the prestige gained through technological inventions and the desire for their surrounding communities' economic success, Stanford University created an adjunct section of the university called

[14] Chan and Olin, 401.
[15] Ibid.

Stanford Industrial Park (Research Park) in 1951.[16] Research Park's main objective was to fund engineering projects and generate a highly innovative community of inventors, designers, and scholars. Early engineering companies moved to the area in large numbers to take advantage of convenient research developed at the university campus. Companies such as Hewlett-Packard and Lockheed-Martin came to Research Park in order to obtain university and government funding that drove their products.[17] Once these engineering companies moved to the area, internal component businesses soon followed in order to have easy access to their customers at Stanford. By the 1960's, there were close to a hundred vacuum-tube and transistor producers and included the prominent Fairchild Semiconductor, Simentics, and Signotics.[18] The increase of such technological related industries was the direct result of research and funding from universities.

Silicon Valley historian Christophe Lécuyer was convinced that the combination of military and educational investment eventually created the basic structure for the personal electronics industry. He argued that the creation of these Research Parks throughout the nation allowed opportunities for innovative growth within the engineering industrial sector; specifically, that the educational institutions chose to sign contracts with military agencies in order to provide innovative new weapon and defense technologies for federal grant money.[19] The unique location of the San Francisco Bay Area provided Stanford University with several contracts as the

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[16] John M. Findlay, *Magic Lands: Western Cityscapes and American Culture after 1940* (Berkeley: University of California Press, 1992), 123-125. Those traveling or living in the San Francisco Bay Area will know Industrial Park as Research Park. While originally named Industrial Park, the name was later changed to Research Park.

[17] Chan and Olin, 401. Also see Display Ad 43—No Title *Los Angeles Times (1886-Current File)*; Aug 21, 1956; Proquest Historical Newspapers. Los Angeles Times (1881-1986), D7.

[18] *Raytheon Papers*. "Files Kept to Monitor the Electronics Industry: 1965-1986," Stanford University Libraries Department of Special Collections, M661. See also Gordon E. Moore "Intel: Memories and the Microprocessor," *Daedalus*, Vol. 125 No.2, Managing Innovation (Cambridge: MIT Press, 1996), 57-58. Fairchild Semiconductor spawned the creation of the Intel Corporation. Intel is the largest manufacturer of semiconductors in the United States.

[19] Christophe Lécuyer, *Making Silicon Valley: Innovation and the Growth of High Tech, 1930-1970* (Cambridge: MIT Press, 2006), 74-75.

military was concerned about protecting the Pacific Coast from attack.[20] As a result, the funding from Stanford and the location of the Bay Area created the environment where Silicon Valley could prosper in technological industries. Without these educational institutional and government investments into technological research programs, the 1970's personal electronic transition would likely never existed.

However, some researchers would argue a different set of circumstances led to the development of the 1970's personal electronic phenomenon. Professor of counterculture studies, Andrew Kirk, suggested that the innovators of the 1970's personal high-tech devices were actually counterculturalists who focused on creating tools for the purpose of sustainable living. Kirk added that the counterculture engineers thought that they could affect the world more pragmatically through personal devices than protesting on the streets.[21] Thinking abstractly about the problems within the American society was one of the main characteristics of the 1960's counterculture movement. The innovators behind many of the personal products of the 1970's and 1980's came from this type of philosophy when inventing new products for the consumer market. Specifically, Steve Jobs, Steve Wozniak, and Paul Allen were all influenced by 1960's movements and believed that the older generation lacked a proper vision of the future.[22] Steve Jobs believed that the world's problems could be solved through the programs installed in the computer. He not only saw the development of personal electronics as merely a

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[20] Lécuyer, 38-39.

[21] Andrew G. Kirk, *Counterculture Green: The Whole Earth Catalogue and American Environmentalism* (Kansas City: University Press of Kansas, 2007), 6-9; 106. However, Kirk was expanding on the idea found in the book *Whole Earth Catalog: Access for Tools*. Although made in 1968, this book was a precursor of the 1970's technological developments by young entrepreneurs and showed that many of the global and individual problems could relatively be solved through technological ingenuity.

[22] Ibid, 106. Steve Jobs and Steve Wozniak co-founded Apple Computer, Inc., while Paul Allen co-founded Microsoft with Bill Gates. Both of these companies proved to be very successful in producing new innovative devices and software.

tool for efficient purposes, but rather the development of a new epoch of human experience.[23] The counter-culture ideology went into the development of personal electronics as a way to define a new age of the human-mechanical relationship.

The *Whole Earth Catalog* was one document that the innovators of the 1970's cite as nurturing their high-technology vision. Indeed, Steve Jobs saw the catalog as the earliest conception of the world-wide-web or the Google search engine.[24] Moreover, the actual *Whole Earth Catalog* creators thought that many of the tools presented within the manual would benefit both the individual and the entire society. Mostly, the catalog encouraged education and personal triumph through self-help technologies and research documents. This goal was stated by the editors in the beginning of the document:

> So far, remotely done power and glory---as via government, big business, formal education, church---has succeeded to the point where gross defects obscure actual gains. In response to this dilemma…personal power is developing---power of the individual to conduct his own education, find his own inspiration, shape his own environment, and share his adventure with whoever is interested. Tools that aid this process are sought and promoted by the *Whole Earth Catalog*.[25]

The similarity between computer programs that emphasized personal research and the ideas sought within the *Whole Earth Catalog* was more than coincidence. The counterculture idea that technology could solve the problems of the individual without government or corporate sponsors went beyond just theory in the 1970's, it was put into practice. Personal electronics represented an adventure for both entrepreneurs and consumers alike, as each benefited from the new innovative technology that made the life experience efficiently superior. 1960's rhetoric was clearly seen within the writing of the *Whole Earth Catalog*, and as a result the document inspired counterculturalists to invent products to change societal thinking.

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[23] John Sculley and John A. Byrne, *Odyssey: Pepsi to Apple… the Journey of a Marketing Impresario* (New York: Harper & Row, 1987), 399-400.

[24] Kirk, 163.

[25] *Whole Earth Catalog: Access to Tools* (Menlo Park: Portola Institute, Inc., 1969), Inside Cover Page.

However, the young 1960's counterculturalists were not the only individuals with dreams of overthrowing the current system. Indeed, those that had suffered from the atrocities of a modern world also thought that personal technology could change the social community. Auschwitz holocaust survivor Jack Tramiel also had a similar conclusion about the role computers had as a tool in society. Tramiel, who was founder of the Commodore computer company, believed that the fascist system that had tried to kill so many innocents during World War II could be destroyed and prevented with the advent of computer technology. He believed that "too many rules…locked [you] into a system."[26] Tramiel believed that computers could eradicate the authoritative state structure that caused the holocaust by creating "maverick" minded individuals "so the rules don't take over."[27] Therefore, for several of the innovators of the 1970's consumer electronic industry, their devices represented a method to challenge and influence social thinking.

Some would argue that the initial new inventions never spawned public acceptance of consumer electronics until large corporations replicated innovative products. Steven Usselman, in an essay on IBM history, argued that large company investments into products came at the expense of trial and error from smaller companies.[28] Indeed, during the 1970's the personal computer market was largely dominated by small upstart companies. Many larger corporations chose to make their own small improvements to a device and advertise their brand name, than invest in expensive research. Even Michael Tomcyk, a marketing analyst at Commodore, noted that large established corporations such as Hewlett-Packard and Texas Instruments would always

[26] Michael S. Tomczyk, *The Home Computer Wars: An Insider's Account of Commodore and Jack Tramiel* (Greensboro: ABC Publishing Companies, 1984), 55-56.
[27] Ibid, 56.
[28] Usselman, 341-342.

wait for an invention to prove its profitability before producing their own copies of a product.[29] Therefore, both upstart innovation and corporate investment spawned the production of consumer electronics, but it took the reputation of large corporations to incite societal acceptance. Usselman and others do not necessarily discount government and educational spending, but they include the smaller details of engineering and corporate philosophies that were important for the creation of 1970's and 1980's products.

While these arguments examined the proposed circumstances that led to the personal electronic production surge in the 1970's, there were many theories that tackled social changes occurring as a result of technological introduction. When Karl Marx wrote on the economic basis of class struggle, he also implied that humans as a collective whole had a unique relationship with their tools of production. This intrinsic relationship between humanity and their tools connected the overall economic mode of production with the political and hierarchical forms of social culture.[30] This argument, known as the base and superstructure theory, defined the relationship between technological advancement and socioeconomic evolution. Marx used the example of the hand-mill and the steam-mill for his technological tools that eventually produced new economical, cultural and hierarchical social identities. The hand-mill created the need for a feudal labor system in order to operate large plantations. Additionally, an invention such as the steam-mill eventually challenged the economic structure of feudal systems and brought about a capitalistic oriented, nation-state society. These impacts on the superstructure

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[29] Usselman, 41-42. Commodore was a computer maker in the 1970's through the 1990's. Their PET computers were the first to reach one million units in 1980, and were an establish computer maker during this time period. However, Microsoft dominance of the PC market, along with numerous computer competitors, soon made their company obsolete.

[30] Robert Heilbroner, "Do Machines Make History," in *Does Technology Drive History? The Dilemma of Technological Determinism,* eds. Merritt Roe Smith and Leo Marx (Cambridge: MIT Press, 1994), 54. Heilbroner used Marx's *The Power of Poverty* as an example of Marx's brand of technological determinism.

essentially came from technological changes in the base mode of production.[31] Marx even stated that these global defining tools become a "world-historical fact," and thus significant in the study of production and society.[32] These "instruments of production" were a crucial mechanism at looking into class hierarchical identity.[33] So if Marx's theory was a valid conclusion in understanding the relevance of significant technological changes throughout *his* history, than what about technological changes in a more contemporary era? Many authors had offered their own ideas on such an issue. The development of the 1970's personal electronic industry offered socioeconomists examples of changes in the base as well as the general social superstructure. Authors research the subject because personal electronics used as technological tools had some influence on the behaviors of American society.[34]

Robert Heilbroner, former professor of economic history, was one scholar who proposed that high-technology and contemporary machinery fits within the Marxist model. Heilbroner, in his 1967 essay "Do Machines Make History," argued that "technology imposes certain social and political characteristics upon the society in which it is formed" and "the machine will reflect….the social relationships of work."[35] Heilbroner's statements' seemed to concur with the Marxist mode of thought towards the techno-societal relationship. Yet, he also correctly stated

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[31] Heilbroner, 54.

[32] Marx and Engels, 58.

[33] Ibid, 69.

[34] I am aware that some scholars contend against the base and superstructure theory, as will be explained later in this section. I am not discounting that individual societies decide the final production use from a technological tool. Yet, I do want to look at some of the ramifications that an accepted change of technology has on the behaviors of one society. Specifically, a behavior change caused by technology may be different in another nation than changes in the United States. I am not stating that technology determines the cultural outcome or development of a society and do not endorse the theory of environmental or inflexible technological determinism. These broad deterministic theories do not necessarily work when taken in the context of world cultures because each society would develop and utilize a technology in a different fashion that could potentially differentiate from European and American socioeconomic history. Specifically, Thomas Patterson states that post-structuralists and post-modernists see "cultural production in different states" as potentially being "political reactionary in one country" while representing "subversive power in another." From Thomas C. Patterson, "Post-Structuralism, Post-Modernism: Implications for Historians," *Social History*, Vol. 14, No. 1 (Oxfordshire: Taylor and Francis, 1989), JSTOR, http://www.jstor.org/stable/4285738, (Accessed June 9, 2009), 85.

[35] Heilbroner, 59; 61.

that technological change was hampered within a society which had no use for a machine. He specifically gave an example of the relationship between machinery and slave labor. While slave labor was inexpensive and plentiful 500 years ago, the twentieth century capitalist system replaced the impractical expensive lower class with inexpensive machinery.[36] Additionally, Heilbroner theorized that if mechanical technology was provided to the masses, there would be large scale consequences within the superstructure of the society.[37] Heilbroner, in using Marxist methodology, conscribed to the notion that mass technological acceptance by the social hierarchy alters behavioral patterns.

Bruce Bimber offered a similar approach to Heilbroner's argument regarding the relationship between socioeconomic change and technology, but disagrees that Marx was a technological determinist. Bimber argued that a production of new technology could potentially produce "unintended consequences" within a society.[38] These unintended consequences were not the fault of engineering planning, but rather society's own method of incorporating and interpreting a certain technology. Bimber essentially proposed that a society could take a tool that was created for one purpose, and instead incorporate the tool to fit a different economic or social function. Many of the electronic tools of the 1970's and 1980's produced a number of consequences that their original architects never foresaw. Yet Bimber believed that technology was only one aspect to socioeconomic change. He did not necessarily believe that Marx was a technological determinist, but rather an economical determinist.[39] Though, Bimber does produce

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[36] Heilbroner, 63-64.

[37] Ibid.

[38] Bruce Bimber, "Three Faces of Technological Determinism" in *Does Technology Drive History? The Dilemma of Technological Determinism,* eds. Merritt Roe Smith and Leo Marx (Cambridge: MIT Press, 1994), 85. The idea of unintended consequences created the concept of engineering ethics among many sociologists and philosophers who dwell into unforeseen consequences of innovative design. For more information on the idea of engineering ethics, please see Deborah G. Johnson and Jameson M. Wetmore. "STS and Ethics: Implications for Engineering Ethics." In *The Handbook of Science and Technological Studies* (Cambridge: MIT Press, 2008).

[39] Ibid, 98.

an interesting suggestion that technology transcended its role as a tool of economic production, and became a celebrated cultural icon for the 1970's and 1980's era as a result of unintended consequences.

While Marx's argument cited economic base transference as influencing the overall superstructure of a social hierarchy, Raymond Williams believed that the concept was more structurally sound when reversed. Williams wrote in a period that was influenced by 1960's and 1970's "New Left" thinking that particularly saw Marx as being too broad and deterministic. In his book *Marxism and Literature*, Williams contended that the cultural superstructure was the main agent in establishing the overall economic base. He argued that base and superstructure were contemporarily misrepresented as "terms of substance," rather than as "terms of analysis."[40] Essentially, Williams found that the general idea of the "base" was reduced to a categorical object, rather than a general production activity.[41] Williams particularly agreed with New Left rhetoric by examining differences between "dominant, residual, and emerging," cultures in the general superstructure of a society. Through this explanation of cultural development, Williams came to the conclusion that ongoing relationship changes within a society's traditional and novel cultures eventually transformed the society's material production base.[42] In short, Williams sees individuals and culture as primary agents of socioeconomic change, whereas this essay looks at technology's influence on the economic base as directing the cultural activities of society. This essay does not intend to refute William's argument but merely offer a different opinion on this socioeconomic relationship. Base and superstructure could be symbolically represented as a "chicken and egg" quagmire that explores whether cultural identity or economic production

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[40] Raymond Williams, *Marxism and Literature* (Oxford: Oxford University Press, 1977), 129.

[41] Ibid, 81.

[42] Ibid, 121; 124-125. For Williams, dominant culture meant the overall accepted culture within a society. Residual was the traditional cultural relationship before the dominant, and the emerging was the counterculture that represented novel methods of social relationships.

developed first. In this essay, the latter position will be used to justify technology's role on 1970's and 1980's superstructural alterations.

Since humans generally are affected by various socioeconomic environmental factors, technology must be seen as causing some of the psychological composition of an individual. Indeed, some researchers saw the development of consumer electronics as not a tool, but as a novel psychological gateway. In her 1984 book, *The Second Self*, Sherry Turkle argued that the use of video games and computer programs created a major transition in society's relationship with machines. Turkle claimed that humanity had entered a new psychological era where there was a "nervous preoccupation with the idea of self as [a] machine" which replaced the Freudian idea of self as a "sexual being."[43] Fundamentally, humanity became obsessed with personal electronics because machines offered a private and intimate relationship that could not be obtained in the existent community. This type of development was significant in the study of human and high-tech interaction because it showed that consumer electronics had huge psychological ramifications. One of the ideas that Turkle presented revolved around the concept of perfection. She argued that since computers were conceived as a perfect and efficient machine, the human owners additionally wanted to be seen as perfect.[44] Since young adults were disproportionately the users of 1970's and 1980's technology, their social development rapidly changed from previous generations as they became more dependent on high-technology for economic and entertainment needs.[45] This concept will also be explored in the later chapters, as video games and computers achieved some level of psychological alterations for the user. The psychological changes on an individual level could also be a determining factor for social superstructure changes.

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[43] Sherry Turkle, *The Second Self: Computers and the Human Spirit* (Cambridge: MIT Press, 2005), 29.
[44] Ibid, 89.
[45] Ibid.

Yet post-modernists would be concerned with the revitalization of these concepts as they do not correspond well with their intellectual beliefs. In contemporary scholarly thought, researchers have dismissed base and superstructure because of its deterministic qualities and the problems of associating broad technological development with social "progress."[46] In an age when nuclear and biological weapons could cause the extinction of humanity, the idea that technology could not necessarily stimulate human "advancement" was quite plausible. In addition to the problems of determinism, post-modernists also attack the usage of technology because of its broad and problematic connotations. Leo Marx, American History Professor at MIT, condemned the use of the word technology as lacking any meaning for the contemporary audience. He argued that "technology" did not have any real relevance until after World War I, when technology was closely associated with mechanical art.[47] However, post-modernists were incorrect in seeing technology as a word without meaning. For the purpose of this essay, the term "technology" will be utilized with its intended meaning, which falls under the Marxist definition as a production tool.[48] Additionally, while this essay does not condone the use of technology as an absolute cause of social changes, the secondary argument suggests that the use of any tool *may* inflict a behavioral change within a society or specific economic class. For this reason, base and superstructure analysis will be implemented during the current study of 1970's and 1980's economical and behavioral patterns.

These arguments taken from various scholars uncover the complexity that technological tools have on society. From socioeconomic explanations to psychological connections, the

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[46] Leo Marx, "Postmodern Pessimism," in *Does Technology Drive History? The Dilemma of Technological Determinism*, eds Merritt Roe Smith and Leo Marx (Cambridge, MIT Press, 1994), 248.

[47] Ibid. Leo Marx defines mechanical art placing technology at the center for human progress through design and mass marketing.

[48] Marx and Engels, 47; 57-58. The term production tool merely means that a technology is being utilized to produce some type of good or benefit.

consequence of past technological change was relevant. However, these causation arguments were pertinent while only looking at the technological transference event through Braudelian perspectives. While many researchers give credence to the long-term investments created from government, education, and innovative processes, perhaps the 1970's economic environment should be used to look at the short-term causation factors. The 1970's represented numerous recession periods for the semiconductor industry. Therefore, their products became more obtainable and inexpensive for hardware and software producers. The coming chapter will show that the semiconductor industry, in its competitive and inexpensive production of microtransistors and microprocessors, opened up a new market of opportunities for the personal electronic industry. As a result of this economic development, technology influenced changes in social and cultural behavior and was significant in analyzing its role as an example within the base and superstructure theory.

Chapter 2: The 1974 Semiconductor Industry and the Consumer Market

The American semiconductor industry in the 1970's was a quagmire of boom and bust economics. As primarily an "intermediate industry," semiconductor companies produced neither complete manufactured goods nor services, but instead offered only components to companies that would then make a final product.[49] As an intermediate industry, semiconductor companies relied heavily on the health and viability of their industrial buyers. When one economic sector such as the defense industry decreased spending, the semiconductor industry usually went into recession. Therefore, recessions within the industry were quite common, as various sectors went through particular weak economic periods. These recessions were the primary economic instigator for the decreasing expense of high-technology internal components.

As mentioned previously, products that used internal circuits were only purchased by military, educational, and corporate institutions before the 1970's. The computer's usefulness for calculating precise locations to send nuclear missiles made the technological system invaluable during the Cold War. These room sized computers cost millions of dollars and calculated complex mathematical formulas derived from complicated and specialized programming. The combined cost and skill level needed to operate these 1960's computers deterred most American citizens from utilizing the device.[50] However, the semiconductor industry was still profitable during the 1960's because the business suited the military industrial complex. As a result, numerous semiconductor companies appeared from 1965 to 1974. Each of these companies promised and developed faster and smaller internal components to compete for

[49] Anne Therese Coughlan. *Vertical Integration Incentives in Marketing Channel Choice: Theory and Application to the International Semiconductor Industry*, Dissertation presented at Stanford University. (March, 1982), Stanford University Libraries-Department of Special Collections, 160.

[50] Hect and Edwards, 4. While it is true that some later television sets did incorporate some of the internal chip components, they were based more on transmission waves and not the chips themselves for functionality.

market share in an increasingly competitive market. Additionally, the semiconductor industry became enormously dependant on military spending during its partnership with the defense industry. By 1974, over two hundred semiconductor companies resided in the United States, with most located in California's Silicon Valley.[51]

Unfortunately, when industrial competition outweighed government spending, the economic vitality of the semiconductor sector faltered. Indeed, 1974 was a year of significant economic set-backs for the American semiconductor industry. While there were several economic recessions that affected the semiconductor industry before this year, 1974 saw a sharp decline in the price/value ratio for internal component producers. The semiconductor price-index, which measures both industrial economic health and the average price for a produced internal component, fell 68.5 percent from 1974 to 1975.[52] While historically, semiconductor prices had occasionally decreased, 1974 represented an unusual collapse.

The 1974 recession within the American semiconductor sector was primarily related to two significant changes in international and domestic developments. The first change to hamper the economic outlook of the semiconductor industry occurred with the "vietnamization" of the Vietnam War in 1973.[53] Since its peak of 388.9 billion dollars in 1968, American defense spending had significantly decreased to 243.8 billion dollars by 1974.[54] These budget decreases were primarily the result of America's active disengagement from the Vietnam War as well as the signing of the 1971 Strategic Arms Limitations Talk (SALT I) which actively sought to curb

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[51] Raytheon Papers 1965-1986. M0661. Stanford University Libraries-Department of Special Collections. The number cited was gathered from lists located in various boxes from 1965 through 1986. However, most of the smaller semiconductor companies existed primarily from the early 1960's to the middle part of the 1970's.

[52] Bruce T. Grimm, "Price Index of Selected Semiconductors 1974-96," *Survey of Current Business* (Washington D.C: U.S. Department of Commerce---Bureau of Economic Analysis, 1998), 12

[53] The term vietnamization was used by the Nixon administration as a war strategy in Vietnam. The United States would slowly withdraw troops from Vietnam while training South Vietnamese troops. This was Nixon's attempt to leave Vietnam with honor. However, this action significantly affected the defense budget.

[54] Martin Calhoun, "U.S. Military Spending 1945-1996" *Center for Defense Information*. http://www.cdi.org/issues/milspend.html.

the growth of nuclear capabilities in the United States and the Soviet Union.[55] SALT I capped the amount of nuclear missiles and silos so that new production of such technology could be curbed. As a result, the military did not need as many high-tech missile devices as they would have originally needed. Obviously the lack of demand increased the supply of semiconductors to the general market. The decrease in the defense budget only increased competitive pricing between semiconductor companies as they competed for market share. American companies were driving prices down for the sole purpose of gaining further market share when demand was low. While obtaining market share was the driving force for almost all companies, the price collapse hampered innovation and high-quality internal components.

Yet the technological developments within foreign semiconductor industries became the second problematic change that influenced the 1974 semiconductor recession. As a result of wide-spread, inefficient semiconductors, many high-tech companies began to look outside the United States for affordable and superior internal components.[56] The Japanese semiconductor market filled this niche. The Japanese chips were equally as inexpensive as their American counterparts but were more efficient and expedient in calculations. Japan's NEC Semiconductor particularly became successful in marketing their products in the United States, and took twenty percent of the American semiconductor market share.[57] Furthermore, NEC and other technology

[55] While the Vietnam War ended in 1975, America's policy of Vietnamization, in which American troop volumes in the country would steadily decrease, became active by the end of 1973. While SALT I talks began in 1971 between the United States and the Soviet Union, the full effects of such talks were not really relative until the beginning of 1973.

[56] Gordon E. Moore, "Íntel: Memories and the Microprocessor," *Daedalus*, Vol. 125, No. 2, Managing Innovation (Created Spring, 1996) JSTOR. http://www.jstor.org/stable/20013429 (Accessed February 3, 2009), 55-56.

[57] Martin Fransman, *Japan's Computer and Communications Industry: The Evolution of Industrial Giants and Global Competitiveness* (New York: Oxford University Press, 1995), 342; 350. While Japanese exports into the United States were present as early as 1965, their presence in 1974 as inexpensive yet effective substitutes semiconductors caused further dilution of the American market.

firms had almost double the patents and technological intensity of their American competitors.[58] The 1974 Japanese strength led to further complications to the American semiconductor sector.

Additionally, Japan's protective trade laws and currency exchange made international competition difficult. Japan still shipped their exports to other countries at an affordable rate that competed with American semiconductor goods, while keeping out American goods through import laws. Along with the benefits of protected imported trade laws, the Japanese also gained from currency inflation. Specifically, the yen's value declined almost twenty percent against the American dollar throughout the 1970's, making Japanese produced goods relatively discounted compared to their American counterparts.[59] The Japanese competition would culminate in the 1980's, when Japanese production finally outpaced their American counterparts.[60] Because of the increasing competition from abroad, the recession of 1974 deepened within the semiconductor industry.

The globalization of trade combined with weak demand from domestic markets subsequently threatened the economic livelihood of the American semiconductor industry. Quarterly losses of 92.4 percent and losses in the millions were not unheard of during these years.[61] Some of these companies during 1974 sustained losses equal to the entire value of the company.[62] Motorola and Signotics, seen as some of the leaders within the semiconductor

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[58] Fransman, 350; 436-437.

[59] Scott Palmer, "Panic in Silicon Valley: The Semiconductor Industry's Cry for Help," *Policy Analysis* no. 31, December 21, 1983, 15.

[60] "STATS: Global Billings Report History (3-month moving average) 1976 - August 2008." (October 2, 2008). *Semiconductor Industry Association*. http://www.sia-online.org. American semiconductors competed abroad and not just domestically. So when Japan and other foreign makers impeded on the foreign market, American manufacturers suffered.

[61] Raytheon Papers 1965-1986, "Siliconix 2nd quarter net drops 92.4%" Box 13 Folder 1 M0661, Stanford University Archives-Department of Special Collections. "Solid State Scientific: 1.7M quarter Loss" Box 13 Fol 5 M0661.

[62] "Solid State Scientific: 1.7M Quarter Loss," *Elecronic Buyers News*, May 26, 1975. Stanford University Archives. M661, Raytheon Papers 1965-1986, Box 13 Fol 5.

industry, cut their prices by twenty-five and twenty percent respectively.[63] Some companies, unable to decrease their prices further were liquidated or bought out.[64] Despite the slump in the industry, companies surprisingly continued creating more efficient and innovative technology. *Electronic Buyers' News* suggested that these "new product introductions" were the direct result of a heavily competitive semiconductor industry.[65] Indeed, the lack of demand for chips, gave incentive to some businesses to research pioneering products. In 1974, Intel came out with the Intel 8080 microprocessor, which was a substantially smaller chip that could miniaturize technology that relied on transistors.[66] Yet many other companies decided to cut the costs of their chips drastically. For example, in 1961 the Signetics Corporation marketed a six transistor chip for $180. That same chip in 1974 cost only 18 cents while a much more productive 10,000 transistor chip cost a bargain-priced 10 dollars.[67] The recession created significant price and size breakthroughs as a result of increased competition and ultimately opened up new markets.

The 1974 to 1975 semiconductor downturn eventually nurtured the high-tech hardware upsurge of the late 1970's and 1980's. The significant decrease in contractual partnerships between military agencies and the high-tech industry gave companies incentives to look for fresh markets. Because internal component prices were low from substantial price/value

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[63] Raytheon Papers 1965-1986 "Semiconductor Product Flow to Continue," *Electronic Buyers News*, September 30, 1974. Stanford University Archives-Department of Special Collections. M0661. Box 1 Fol 2.

[64] Ibid.

[65] Ibid.

[66] Moore, "Íntel: Memories and the Microprocessor," 76-77. Semiconductors had evolved significantly since the first transistor was created in 1947. The transistor was merely a transportation device for electricity, which sent signals within the device corresponding to specific language codes created by a programmer. The programmer or user inputs data, and this data is subsequently sent as an electrical signal to create a corresponding output. The creation and further development of the microprocessor created a system where the computer could store and remember the data signals for later use. This memory storage system allowed for programmers to create software for the machines that incorporated internal components. By placing more transistors and memory storage capabilities into a given machine, semiconductor manufacturers were increasing the likely-hood that more complex programming and software could be created.

[67] Raytheon Papers 1965-1986. Signetics, Stanford University Libraries-Department of Special Collections. Call M0661, Box 12, Fol 1.

recalculations, companies began to look at the consumer market for further revenue.[68] For the semiconductor industry, this change meant that more of their technology would be used within the visible social community, instead of behind classified military walls. An example of the transition to the public sphere can be seen in the following chart that portrays the different business sectors that bought American produced integrated circuits:

Table 1 .---Customers of Internal Component Industries.

Markets	1962	1965	1969	1974	1978
Government	100%	55%	36%	20%	10%
Computer	0	35	44	36	38
Industrial	0	9	16	30	38
Consumer	0	1	4	15	15
Total U.S. domestic shipments (millions)	$4	$79	$413	$1,204	$2,080

Source: Fabrizio and Mowery, "Federal Role in Financing Major Innovations," 293.[69]

Clearly 1974 was a year of tremendous growth in the consumer markets. While the share of military sales seemed to decline well before 1974, the military and educational institutions still bought most of the computer and industrial made products. Since the semiconductor industry positioned itself as an intermediate market, the percentage decline of government purchases clearly correlated with the rise of private sector produced goods. Nevertheless, the rapid growth in the consumer sector was the result of the opening of new economic niches within the semiconductor market.

Yet the American family in previous decades utilized some type of semiconductors within their own home entertainment appliances. The television, while filled with rather simple internal components, still relied on some type of electronic transportation in order to function.

[68] Kira R. Fabrizio and David C. Mowery "Federal Role in Financing Major Innovations" *Financing Innovations in the United States, 1870 to the Present*, eds. Naomi R, Lamoreaux and Kenneth L. Sokoloff (Cambridge: MIT Press, 2007), 293.

[69] Ibid.

But human interaction with a television was limited to viewing a transmission with no mechanical input other than turning a dial. Additionally, the transistor radio also contained some semiconductors, but was never as successful as the consumer electronics in the 1970's.[70] The complex method of inputting data into a machine to produce a significant interactive output required a much more intricate microchip then seen in earlier consumer products. The computer and other 1970's and 1980's consumer electronics, entirely relied on a system of input, output, and memory processes. Unfortunately, this type of system was still too expensive and underdeveloped for mass production and was largely confined to the defense industry before 1973.

However, with the downturn in the semiconductor industry, independent innovators could bring complex high-technologies to the public while maintaining large profit margins. Companies involved in consumer electronics and software took advantage of such inexpensive materials by offering the public technological breakthroughs. Video game hardware and software producer, the Atari Corporation, was one example of creating consumer innovation from falling internal component prices. As the self-labeled "leader in innovative leisure," Atari created various arcade video games that functioned on a combination of programmed software and innovative computer technology that incorporated internal component chips.[71] Their most notable game, *Pong*, essentially consisted of two paddles on opposite ends hitting a moving ball until one side missed.[72] The game became a cult classic in the 1970's, and was widely seen as a breakthrough in innovative electronic gaming technology. While Atari was known to specialize

[70] Moore, "Intel: Memories and the Microprocessor," 55-56.

[71] Atari Business Plans 1974-1975, Stanford University. M1641 Box 1, Stanford University Libraries-Department of Special Collections, "Business Plans-June 1973 to May 1974," Section IV. While Atari was founded on June 20, 1972, they did not achieve significant monumental success until fiscal year 1974.

[72] Ibid.

in the home gaming industry, this type of concept was not widely accepted until 1977.[73] Instead, the 1972 version of *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."[74] These were gigantic arcade video-gaming machines, yet their introduction to the public market signaled an important transformation of semiconductors being visible outside the private and spheres of the American military and educational institutions.

The economic data presented by the Atari Corporation during fiscal year 1974-1975 showed considerable gains in profit as a result of decreasing semiconductor prices. Basic economic understanding of their production costs allowed Atari to obtain massive profits. Because global economic competition drove these semiconductor prices lower, by 1974 companies like Atari could secure a hefty profit. For example, in Atari's first year of business from fiscal year June 1972 to June 1973, the company posted 3.2 million dollars in net sales. Yet by June 1974, that number had risen to 10 million dollars in new sales.[75] Additionally, gross margins increased drastically. In 1974, the cost of a product sold was sixty percent of the overall price. By 1975, this cost decreased to fifty-two percent while gross profits increased from twelve to twenty-three percent. These financial results were largely due to an eleven percent drop in material and overhead costs.[76] *Business Week* even commented in November 1973 that "the technology behind *Pong* and the other video games is the integrated circuit, which in the last

[73] Atari Business Plans 1974-1975, "Business Plans-June 1973 to May 1974," Section IV. Those that grew up with the Atari 2600 gaming console would recognize Atari's leadership in the home gaming industry. However, this technology was not released to the public market until 1977. Before this year, Atari produced individual games for public arcades and the Magnavox Odyssey gaming system.

[74] Ibid.

[75] Atari Business Plans 1974-1975, Stanford University. M1641 Box 1, Stanford University Libraries-Department of Special Collections,, "Business Plans-June 1974 to May 1975."

[76] Ibid. Of course, the material and overhead cost were largely dependent on semiconductor costs.

few years has emerged as a cheap and widely available device for computer logic functions."[77] Charles E. McEwarn, president of the communication company Ramtek Corp, also commented by stating "These circuits have made it possible to build games at reasonable costs."[78] These statements revealed the fundamental economic relationship between the availability of high-tech consumer electronics and the necessity of inexpensive semiconductor components.

Yet the Atari Corporation was not satisfied with merely a successful arcade business. By 1975, Atari had a vision of a video game console that could be utilized within the family home. While Magnavox's Odyssey, the first home consumer video game console, had been widely available since 1972, Atari saw Magnavox and its console's games as "neither very challenging nor sophisticated."[79] At first, Atari sold video games for the Odyssey console through secondary suppliers. For example, Sears bought 75,000 Atari gaming cartridges to be sold through their Christmas catalogues for fifty dollars per game.[80] By 1975, Atari executives already believed the American society was in a transitional period toward a high-tech electronics age. In 1975, Atari commented on its long term outlook by stating:

> New game concepts and proprietary chip designs will make the consumer market a practical target to shoot for with appropriately priced products. Exciting low cost electronic games of skill and mental challenges will naturally expand the concept, so popular today in the audio and video fields, of the 'Home Entertainment System.' 1975 will be the big year for the Home Electronics Game.[81]

The aforementioned quote contained the expectations of the Atari Corporation and much of the high-tech industry. These creators of household consumer electronics knew that with inexpensive production costs, they could make technology affordable for the masses and thus

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[77] Atari Business Plans, 1974-1975, Stanford University, Department of Special Collections. Call M1641, Box 1. "A Red-Hot Market for Video Games" *Business Week*. November 10, 1973, 19.
[78] Ibid.
[79] Atari Business Plans 1974-1975, "Business Plans-June 1973 to May 1974," Section I.
[80] Ibid.
[81] Ibid, Section II.

create a new means by which society received entertainment. While Atari still remained profitable by selling arcade machines in public settings, they desperately wanted to expand their products into the American consumer household where executives thought would significantly increase revenue for the company. From 1972 to 1974, the transition from the military realm and into the visible public areas of American life started to appear with the declines in internal component prices. The Atari example gave credence to the argument that consumer electronic industries were economically dependent upon their semiconductor components for successful incursions into the public market.

If the semiconductor market represented an economic determinant for consumer electronic availability to the public market, then changes within the industry would represent a dynamic shift in the overall production base. The breakdown of the price/value relationship from domestic and global markets substantially harmed the semiconductor industry. Since a saturated industry caused collapses in customer demand, companies that made chips needed to decrease their prices in order to compete for survival. As a result, other industries prospered, and interactive electronics became available to the consumer rather than just the military or the economic elite. The price collapse combined with the growing sophistication of smaller multi-transistor chips created the potential of an expansive public market. Yet the period in the early 1970's only represented a glimpse of the future. While the semiconductor industry enjoyed a one year recovery in late 1975, the market collapsed again from 1976 to 1977. With the additional collapse in internal components, 1977 could be seen as the defining moment in the development of high-technology for the masses.

Chapter 3: "Computers for the Masses": 1977 and the Computer Revolution[82]

While 1974 represented the birth of high-technology consumer products, 1977 became the pinnacle year when innovative products were visible in many areas of society. The further decrease of semiconductor prices continued the market capitalization by larger companies and brought inexpensive internal components to the public market. However, in terms of the production of new consumer electronics, 1977 was often seen as the revolutionary year that finally saw consumer acceptance of information technology tools within the market place. In 1977, computer companies such as the Apple Computer, RadioShack, Commodore, and Atari, all introduced computers meant for personal applications. These computers were used in the business, educational, and home locations of an individual's life. Corporate marketing compelled individuals to purchase high-technological devices, which succeeded in increased sales. By 1984, these products were no longer considered a novel invention, but instead an accepted production tool of the American society.

Consumer consumption of semiconductor incorporated technologies began when prices for internal components further decreased by substantial amounts. The following graph produced by the United States Commerce Department, details significant changes within the Semiconductor Price Index; specifically for sixteen kilobyte Dynamic Access Memory (DRAM) and other metal-oxide memories (MOS):

[82] Data Welt "Early History of Jack Tramiel's Commodore," *Commodore Computers/ca,* Interview, (November 6, 2004), http://www.commodore.ca/history/people/jack_tramiel_early_history.htm, (Accessed February 2, 2009).

Table 2.---Prices of 16 Kilobit DRAM.[83]

Year	Dollars per Chip	Production in Thousands
1976	52.50	54
1977	23.00	2,008
1978	9.25	20,785
1979	6.13	53,218
1980	4.81	184,020
1981	2.11	221,473
1982	1.24	286,290
1983	1.05	296,610
1984	1.11	161,290

Source: Bruce T. Grimm, "Price Index of Selected Semiconductors," 11.

Table 3.---Memory Chip Price Index[84]

Year	Index	Percent Change
1974	1,778.37	----
1975	560.57	-68.5
1976	343.62	-38.7
1977	199.23	-42.0
1978	116.68	-41.4
1979	97.33	-16.6
1980	68.97	-29.1
1981	33.48	-51.4
1982	20.73	-38.1
1983	15.13	-27.0
1984	11.86	-21.6

Source: Bruce T. Grimm, "Price Index of Selected Semiconductors," 12.

These graphs show the severity of these price collapses for microprocessors during the 1970's. In 1977, these prices were reduced to such a level that suitable and inexpensive personal computers could be marketed towards the public. As seen in Table 2, the production of the sixteen kilobit DRAM increased more than 3700 percent, while prices fell by about fifty percent from 1976 to 1977.[85] These economic numbers formed directly from technological production that shifted from the private sector to the consumer market. Because competitive pricing within the semiconductor industry brought internal component expenses down for hardware electronic companies, computers became increasingly inexpensive to produce and thus marketable to the public masses.

In addition to price declines in internal components, the power of semiconductor technology advanced to incredible levels by 1977. One theory that explained the predictable

[83] Grimm, 11.
[84] Ibid, 12.
[85] Ibid, 11-12. DRAM and MOS memory systems were essential early forms of internal components for computers and most consumer electronics. They provided a computer system with memory so that programs could run effectively on a computer. Without the programs for the computers, the computer itself would be fairly useless, as it would only be a machine with input and output capabilities.

increase in semiconductor prices was future Intel founder Gordon Moore. Gordon Moore, while working at the Fairchild Semiconductor Company created a fairly accurate theory to explain the evolution of the microchip. In what was termed "Moore's Law," Moore theorized that continued research and development into microprocessor technology, potentially made the amount of mechanical internal components double exponentially every two years.[86] Moore explained that the size of the containment area would expand to allow more chips to be placed on a wafer, which would create more powerful processing devices. Additionally, with the development of silicon based electronic chips, smaller transistors could be placed on a miniaturized wafer.[87] From the 1960's through the 1990's his theory correctly identified the evolutionary and predictable process of semiconductor growth. From 1959 to 1980, the components per chip or byte, for a high-tech electronic device increased from 100 bytes to 256 kilobytes. In 1985, this number increased to one megabyte, while in 2000 the number was at an astronomical one gigabyte.[88] These advancements could not occur without the help of semiconductor producers, particular Fairchild and Intel, which miniaturized the chips to such an extent that these evolutionary computer processes could be established. The decreases in both price and size of internal components in 1977 substantially reflected upon the products that utilized internal components.

Because of miniaturization and price developments within the semiconductor industry, products that utilized internal components began to evolve as well. Computers and video game consoles in particular showed these changes in 1977. Instead of having a computer that took up

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[86] Gordon E. Moore, "The Future of Integrated Electronics" in *Understanding Moore's Law: Four Decades of Innovation*, ed. David C. Brook (Philadelphia: Chemical Heritage Foundation, 2006). 38; 53-54. While this theory is relatively disproven in our contemporary society because of heating complications, in the 1970's and 80's, transistors did double relatively every two years. From 4 kilobytes to 264 kilobytes, these chips did evolve on an exponential level

[87] Ibid, "Cramming More Components onto Integrated Circuits," 56-58.

[88] Ibid, "Moore's Law at 40," 76.

an entire isolated room, the devices instead fit on a desk. The accessibility of an organizational device that fit on a desk meant that old productivity tools such as typewriters, folder libraries, and large amounts of physical paperwork became obsolete. In addition, computer systems that used to cost between 20,000 to 2,000,000 dollars a decade earlier, could be purchased for less than 600 dollars in 1977.[89] The decrease of prices for the computer appealed to the masses and opened up the public consumer market for high-tech growth. The Apple Computer Corporation commented on such a drastic change by stating, these prices "make it possible for any family to own a computer."[90] Because computers were billed as an efficient electronic organization tool, the device's application could be utilized by almost any American individual. The computer's jump from the industrial and governmental market to the consumer market was the direct result of the decrease in the semiconductor's prices and size.

The 1977 cost for the personal computer gave an incentive to consumers to buy innovative technology. Prices for the Apple II circuit board ranged from 600 dollars for a four kilobyte system, to 2,275 dollars for a forty-eight kilobyte system. Although, the entire monitor and software four kilobyte system cost 1,298 dollars, this price was seen as a bargain considering the 20,000 dollar asking price for a similar system sold a decade before.[91] In addition, other computer makers offered a similar price enticement to garner market share within the newly developed personal computer industry. For example, in what was an obvious business ploy to compete with the 600 dollar Apple II, the Commodore Corporation's 1977 PET computer was marketed for 595 dollars.[92] Additionally, RadioShack's TRS-80 computer was priced at 599.95 dollars, and subsequently succeeded in selling 37,000 personal computers during the 1977 fiscal

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[89] Apple Ephemera Collection, "A Consumer's Guide to Personal Computers" (1977), M0825, Box 2, Fol 12, Series 3: Product Information, Apple II, Stanford University Archives and Special Collections, 8.

[90] Ibid.

[91] Ibid.

[92] Tomczyk, 35

year.[93] Jack Tramiel, founder of Commodore, knew that the price barrier kept the public consumer from buying the expensive production tools. At one point, he deliberately cut the cost of a 1979 color monitor in half to 300 dollars in order to make sure the consumer market would open.[94] These companies cut their prices to provide consumers with an affordable method to purchase a relatively new technological device.

Even video game makers such as Atari could profit off the miniaturization of the semiconductor. While still offering bulky arcade machines for operation in public recreational centers, Atari produced one of the first successful home video game consoles for a mere $199---the Atari 2600.[95] Atari sold a massive 250,000 of these consoles to the public market from December 1977 to 1978. By 1979, Atari sold 400,000 video game consoles in that fiscal year alone.[96] These successful sales were due to the inexpensive price for the Atari 2600, and the economic strategy of vertical integration that Atari placed in the production of their merchandise.[97] By monopolizing games under the Atari platform, the company could essential brand their games as exceptional in the gaming market. Meaning, an individual would have to buy an Atari 2600 console to play a particular Atari game. One example was the *Space Invaders* game that sold a phenomenal 350,000 copies in 1979.[98] The primary reason that consumers purchased an Atari console was the ability to play *Space Invaders*.[99] Through this economically sound, vertical integration strategy, Atari could create a unique brand for consumers to identify in the consumer electronic market. These strategies could not prevail without the pricing and

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[93] Leonard H. Roberts, *RadioShack Corporation: A Story of Extraordinary Growth* (New York: The Newcomen Society of the United States, 2001), 16.

[94] Tomczyk, 47-48.

[95] Scott Cohen, *Zap!: The Rise and Fall of Atari*, (New York: Mcgraw-Hill, 1984), 66.

[96] Ibid, 78-79.

[97] Coughlan, 2-5; 160. The economic concept of vertical integration means that businesses own the resources to produce a final product. In the case of Atari, the company produced the video games and the video game system, which disallowed outside companies from making video game cartridges for the Atari console.

[98] Cohen, 78.

[99] Ibid, 76-78.

accessibility of internal components. As a result, the consumer market was filled with never before seen, inexpensive computers and personal electronics in 1977.

Innovative companies additionally used advertisement as a method to reach the consumer market. As most economists know, marketing a product at a relatively inexpensive rate does not necessarily mean economic success. Indeed, many corporations utilized marketing tactics that billed the machines as an absolute necessity for individuals. Apple's advertisement campaigns were particular successful in deeming products as personal needs. For Apple, these goods did not represent luxurious desires, but instead fundamental needs for an efficient and productive lifestyle. Apple, along with several other companies, began to introduce their computers with price lists at consumer trade shows and electronic catalogues. This advertising phase meant to produce initial interest in the devices for hobbyists and researchers. Seeing that small businesses expressed interest in the personal computer, businesses subsequently advertised through mass solicitations through the mail. Apple for instance would mail complete folders to individuals that explained the computer's usefulness as a productivity tool.[100] In its mailed booklet, "A Consumer's Guide to Personal Computers," Apple predicted that by 1985, seven out of ten households would own a computer because "computers are becoming as much a part of the progressive household as microwave ovens, encyclopedias, and color TV recorders."[101] By associating their products with necessary and common household possessions, Apple clearly attempted to conjure the image of the computer as an accepted technological tool.

In making the computer a necessity, Apple fundamentally conveyed the specific usefulness of the computer in all facets of society. Apple's advertising campaigns enlightened

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[100] Apple Ephemera Collection, "A Consumer's Guide to Personal Computers," Box 2, Fol 12, Series 3: Product Information, Apple II, Stanford University Archives and Special Collections. The Stanford University Archives held an assortment of mail sent by Apple promoting the Apple II brand. Most of the mail was showing usefulness of the Apple II as a business and educational tool.

[101] Ibid, 8.

its recipients with the message that "Computers became part of the modern lifestyle because mankind wanted better tools for solving problems and keeping records."[102] Yet this idea suggested a much broader message than just the computer's ability for data processing. Apple instead looked at the increased efficiency the computer could offer within the workplace, education, and home locations. The latter area on this list was one that Apple especially targeted. Apple deeply believed that the personal computer could become an integrated tool for the common home. In their advertising photos, Apple showed children receiving home educational lessons from computer programs, while completing homework using word processing programs. Furthermore, homemakers were seen balancing budgets, producing menus, and keeping track of kitchen inventories using the Apple II, while white collared workers were seen bringing assignments home for completion.[103] These images of the home and the computer transmit two crucial messages to the American consumer. One, that the computer created a simpler lifestyle by providing a beneficial avenue for learning and organization; and second, that the personal computer was not simply a hobby or a whim, but an accepted tool of society that transcended both generational and social classes. Indeed Apple commented that consumers absolutely needed the computer because it would bring "long term usefulness" for an individual's goals.[104] To bring the new production tool to the household meant a significant change from how individuals would operate. Yet these changes in the home would be seen more clearly in the 1980's than during the first introductory period of these products.

Nevertheless, the computer did make its way into the educational and business institutions of the 1970's American society and offered greater efficiency in menial tasks. The Apple II, Commodore PET, RadioShack TRS-80 all incorporated Beginners All-purpose

[102] Apple Ephemera Collection, "A Consumer's Guide to Personal Computers," 2.
[103] Ibid, 8-10.
[104] Ibid, 18.

Symbolic Instruction Code (BASIC) programming that provided a meaningful divestiture towards mounting paperwork by storing word documents, spreadsheets, and informational data all within one electronic system.[105] Additionally, early modems through phone-lines allowed for real time communication between offices and personnel. Specifically, businesses utilized computers to transmit stock data from around the world so that investors could make quick profitable trades.[106] The business world essentially invested into the personal computer because the devices filled an efficiency niche. Complicated paperwork and information lists were all organized into one area with storage capabilities that could last years. The time saved through using the computer as an organization tool allowed workers to concentrate on other ventures. Additionally, the computer allowed data to be transferred quickly into graphs and presentations.[107] These were useful in creating a polished and modern look for companies as industries continued to reinvent themselves by using the new technological tool.

In addition to the business world, personal computers in 1977 created further advances in the education community. While computers were already widely used in most universities, the mass production of the personal desktop computer meant that entire campus communities could access the device. No longer were computers restricted to only the professionals and researchers of the university. Instead, undergraduates and other non-professional students could utilize the efficient organizational tool of the computer for projects, essays, and general organization. As a replacement for the typewriter to create essays and theses, students could store their work on a computer and print their work in an organized and practical method.[108] For university students

[105] Apple Ephemera Collection, Box 5, Fol 1 Series Manuals , Fol Title Apple II.
[106] Ibid, Box 2, Fol 14, Series 3, Apple II Communications Interface.
[107] Ibid, "A Consumer Guide to Personal Computers," 6-7.
[108] Ibid, 9.

and authors, the use of computers and calculators meant that their formulaic operations and works of writings would be completed expeditiously.

In 1977, the computer was not only heavily advertised as essential for educational goals at school, but within the home as well. Apple specifically advertised their vision of a society that utilized computer programs as an aid to their own personal educational advancement. One of the images within their 1977 catalogue for the Apple II showed an adolescent child learning basic arithmetic from an educational program.[109] However, Apple also stressed that the tool could be utilized as a sufficient educational avenue for adults as well. As a later CEO of the Apple Company John Sculley stated, consumers needed to use the Apple computer to "study a foreign language, express hidden artistic talents, or publish a newsletter for your club."[110] Indeed there was no doubt that the computer was not only useful as a business organization tool, but also an educational resource for those that wanted to advance themselves. In 1977 and beyond, Apple advertised their computers not as luxurious wants, but as absolute needs to the American society.

The Apple Corporation needed to develop their own unique marketing scheme to set their product above the competition. Not only did Radioshack and Commodore compete with Apple on a pricing level, but electronic industrial giants such as Texas Instruments, Hewlett-Packard, and IBM started to research their own cutting-edge electronic devices. One technique Apple employed was to glamorize the Apple II as a trouble-free type of device that would help individuals with daily needs. In one of their advertising pamphlets, Apple stated Apple II's "beauty is in its simplicity. It's a complete, ready to use computer not a kit. Everything is included."[111] Clearly Apple was marketing their computers as the most reliable and simple

[109] Apple Ephemera Collection, "A Consumer Guide to Personal Computers, 10.
[110] Ibid, Box 2, Fol 1, Series 3: Product Information, L1.
[111] Ibid, Box 2, Fol 13, Series 3: Product Information, "Simplicity is the Ultimate Sophistication: Introducing Apple II, the Personal Computer," 2.

computer for customers to comprehend. Apple also implemented this idea within their business philosophy when one of the advertisement pamphlets stated "Simplicity is the ultimate sophistication."[112] By connecting their device to ease of use and elegance, Apple gave a convincing argument that their computers were unsurpassed in the industry. In addition to incorporating wording that denoted their products as superlative, Apple also offered a pseudo-list of superior features that was not found in other computer products such as keyboard accessibility and warranty. In this list, Apple does not use other computer companies and instead opts to incorporate the names of "Brand A" and "Brand B" to compare with the Apple II.[113] Through this type of vague comparison, Apple attempted to identify their company as having the most innovative and worthy computer products on the market.

However, by 1979, most of the computer makers had followed a similar business approach and as a result, the consumer electronic market became extremely competitive. The same problems of market dilution that had challenged the 1970's semiconductor industry were additionally seen in the 1979 personal computer industry. In 1979, the computer industry relied on the price/value strategy that had befallen the semiconductor market only five years earlier. In what was known as a "computer war" by Commodore marketing consultant Michael Tomczyk, 1979 was seen as a year Apple, Commodore, Radioshack, and even Atari all fought for market dominance through advertising coercion methods. Tomczyk was hired at Commodore to change the marketing and consumer compatibility of the company's business strategy. While Apple astonished the consumer market with glitzy and chic advertisement, Commodore had provided little advertising effort to reach consumers before 1979. Tomczyk stated while Commordore had

[112] Apple Ephemera Collection, Box 2, Fol 13, Series 3, 2.
[113] Ibid, "A Consumer's Guide to the Personal Computer," 11-12.

"the best computer for the money….nobody [knew] it because [their] marketing [was] lousy."[114] Instead, Commodore held an indirect marketing strategy targeted at secondary education students. Commodore offered various school districts the chance to buy three commodore computers for the price of two. This deal allowed computer dealers to constantly stock Commodore products while simultaneously giving the Commodore Company a tax write-off.[115] Additionally, this marketing strategy allowed children to become accustomed to the Commodore brand, while bringing their parents into the world of personal electronics. Commodore hoped to expose children to its computer to have loyal customers in the future. While Commodore had these initial small marketing strategies, the lack of broad and visual advertisement made Apple seem like the only acceptable alternative for consumers.

By 1980, Commodore developed a new advertising campaign to compete with the competitive computer market. Jack Tramiel knew that Apple was winning the advertising war against the Commodore brand. In order to compete with Apple, Tramiel decreased the initial price for the newly developed Commodore VIC-20 color computer to 300 dollars.[116] The price was discounted at fifty percent off their closest competitor, which happened to be the Commodore PET, Apple II, and RadioShack TRS-80. Tramiel knew that in order to compete in the personal computer sector, Commodore needed to make computers obtainable to all economic classes and not just the elites. Tramiel stated, in what would be the marketing slogan for the Commodore VIC-20, "We have to sell to the masses, not the classes!"[117] Tramiel wanted the working class to incorporate the computer into their neighborhoods and school districts that were unable to afford the more expensive branded electronics. Essentially, he dreamed of having all

[114] Tomczyk, 22.
[115] Ibid, 93.
[116] Ibid, 104.
[117] Ibid.

economic classes benefit from the efficiency and education value that made computer software so valuable for the American elite.[118] By marketing their computers as obtainable to the masses, Tramiel and Commodore could compete with Apple's utopian styled advertisements.

These competitive developments between computer companies led to the mass production of computers for the consumer market. However, personal computer companies moved from promoting their devices towards businesses, hobbyists, and school districts, to the broader consumer home market by end of 1980. In the 1970's many of these devices were still seen as part of the "nerd" community, and not a home necessity.[119] However, 1981 and 1984 both offered examples where personal electronic devices became an accepted tool of the American society. In 1981, the IBM PC was introduced with DOS software developed by Microsoft, while in 1984, Apple's Macintosh was produced. Both of these devices would have expounding implications on a society that cherished innovation, simplicity, and efficiency.

The computer revolution represented a significant modification to the United States' mode of production in terms of efficiency value. At the beginning of 1977, Americans owned approximately 48,000 computer devices. However, by 1980, this number increased exponentially to over one million personal computers sold, with the years 1983 and 1986 growing from thirty million units to over sixty million units sold respectfully. During the 1980's, approximately 50,000 computer units were sold on an average weekly basis.[120] With only twenty-five percent of the devices used in the home, these computers were overwhelmingly used in the work place for organization and efficiency purposes.[121] Yet the computer was used as

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[118] Tomczyk, 117.

[119] Andrew Pollack, "Big I.B.M.'s Little Computer." *New York Times (1857-Current file).* August 13, 1981, (Accessed February 3, 2009) from ProQuest Historical Newspapers The New York Times (1851-2005), D1.

[120] David E. Nye, *Consuming Power: A Social History of American Energies,* (Cambridge: MIT Press, 1998), 238-240.

[121] Maureen B. Gray, Consumer Spending on Durables and Services in the 1980's. *Monthly Labor Review*, *115*, (May 1992,) 19-20.

the organizational tool of the 1980's. Apple computer commented on the device's iconic stance by including in their 1983 company profile definition, "Apple Computer, Inc develops…personal computer systems – the productivity tools of the 1980's – for business, education, science industry, and the home."[122] For the home, many computer makers foresaw the computer's usage as a tool to quickly process everything from financial records to recipe guides.[123] Documents that took hours to write and organize could essentially be stored faster and more easily through the new computer systems. The purposes of these devices transcended conventional methods of organization, and created an electronic means of unprecedented efficiency.

By 1981, brand name corporations that usually dealt with large conventional business and government computing machines began to move into the personal computer market. In 1981, the IBM PC was introduced to the public as a viable computer that was better than Apple. Many newspapers hailed IBM's move into the personal computer market due to their symbolic representation as an established corporation. Since the development of the personal computer concept, the industry had been largely marked by small start-up industries that attempted to create inexpensive, yet untested devices for the public market. However, IBM's incursion into the personal computer industry meant that the market had finally gained legitimacy. The computer was no more innovative or inexpensive as the Apple II, but was a brand name that Americans could recognize.

The introduction of the IBM PC meant the computer market shifted from merely a fad controlled by a few hobbyists and business executives to a more expansive market that targeted the household.[124] On the day the IBM PC was announced in August of 1981, Michael

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[122] Apple Ephemera Collection. Apple II. Stanford University, Department of Special Collections. Call M0825, Box 2, Folder 12, Product Information.

[123] Ibid.

[124] Pollack, D1.

McConnell, who was vice president for a chain of computer stores, argued in the *New York Times* that computers were no longer a trend within American culture.[125] McConnell rationalized that the mass marketing of the computer as a necessary tool spawned the 50,000 computers a week sales phenomenon.[126] By the end of 1981, the computer had become an accepted technological device necessary to conduct competent business transactions quickly and effectively. Because the computer had incorporated itself as a genuine production tool, the computer became an established mode of production.

The IBM PC created a computer industry that became economically diluted and extremely competitive. IBM created their personal computer to essentially challenge Apple's dominance in the market. The creation of the computer was merely an attempt to make Apple obsolete. Furthermore, the drive of competitiveness between the two industries fostered a price/value situation for small companies by 1982. This price/value collapse was similar to semiconductor competitive price decreases of the 1970's. Indeed, company giants such as Commodore slashed their prices on their latest innovative computer models, while smaller computer companies went bankrupt. John Sculley even commented in a 1983 letter to shareholders that the price/value relationship had been "violated" to the point where recession was forced upon the computer market.[127] By 1982, there was a clear recession within the personal electronics industry as a result of competitive production between Apple and IBM.[128] Furthermore, lower end personal computer companies, such as Commodore, were selling devices

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[125] Pollack, D1.
[126] Ibid.
[127] Apple Ephemera "Annual report 1983," Box 1, Fol 1, Series 1: Corporate Communications, 4.
[128] Cohen, 112; 120; 132. The computer industry was not the only sector suffering from a recession. Indeed, the broad economy of 1982 was in recession as a result of inflation and over production. The video game market particularly had trouble coping in the downed economy. Those that played video games knew about Atari's 1982 *E.T.* game that failed so horrendously that the game largely caused Atari's downfall. 1982's *E.T.* is largely considered the worst video game of all time because of its lackluster sales, playability problems, and Atari's overproduction of the product in a poor economy.

at levels where establishing market-share was the sole goal.[129] Indeed, in order to compete from 1982 to 1983, Apple spent 100 million dollars in advertising revenues, almost eighteen percent of their total expenses.[130] Yet, even Apple had to cut the price of their luxurious 10,000 dollar Lisa computer system in order to compete in the competitive market.[131] Because the personal electronic recession of 1982 and 1983 was caused by an oversaturation of electronic companies, companies had to aggressively compete.

Where the industry suffered due to saturation of the market, the consumer prospered. The market for computers shifted towards the home for educational and gaming reasons. In another 1981 article, the *New York Times* reported that a large number of parents and students were buying computers for entertainment and educational production reasons. Computer store managers found that many of their customers' "primary motivation for buying a computer was its potential for facilitating the career advancement of parents and academic achievement for their children."[132] Apple and Commodore had been promoting this same argument since beginning production in 1977. Essentially, the computer was being used as a production tool to elevate one's socioeconomic position within American culture. By utilizing computer programs that focused on education and economic organization, computer consumers could effectively focus on their own individual improvements.

Because there was such a drive for competitive markets, the personal computer industry produced more innovative and developmental products. In 1984, Apple introduced the Macintosh personal computer. Unlike the Apple II, Commodore VIC-20, and the IBM PC, the

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[129] Apple Ephemera "Annual report 1983," Box 1, Fol 1, Series 1: Corporate Communications, 4.

[130] Ibid.

[131] Ibid, 17. However, the Lisa computer was built for the business executives and the economic elite. The Lisa was the first computer to incorporate the mouse and the graphic user interface. Its extravagant price was thought to match the breakthrough software design found within the computer.

[132] Andree Brooks "Homes Adding Computers for Christmas." *New York Times (1857-Current file).* . December 20, 1981. (Accessed February 3, 2009) from ProQuest Historical Newspapers The New York Times (1851-2005), CN1.

Macintosh ran on software that included a graphic user interface design instead of the conventional linear programming. Where older computers required the user to input codes to run programs, Macintosh allowed individuals to use a mouse to control coded icons that automatically programmed software for the user.[133] This made command-line interfaces such as Microsoft DOS and BASIC programming obsolete.[134] The Macintosh system, at a cost of 2,000 dollars was relatively more expensive than other computer brands due to the advanced technology made available on the device.[135] However, these innovations were one method companies sought to compete and garner market share during an economic recession period.

The creation of Macintosh was an exceptional development for the computer industry, but it took Apple's brand of marketing to make the graphic user interface design acceptable to the public market. Apple continued its innovative advertising approach for the Macintosh by claiming the new computer as "revolutionary" and "simply beautiful."[136] While the concept of the mouse and graphic user interface was bought from the Xerox Corporation, Apple adopted the technology under their own name, and thus formed their own unique computer identity. In their famous 1984 super-bowl advertisement, in which they displayed a mocked rendition of the George Orwell book *1984*, Apple explicitly targeted the large IBM Corporation as being the "big brother" of American society.[137] Indeed, IBM was the same company attempting to destroy Apple in 1981 with the introduction of the IBM PC. The Macintosh computer, in turn, was

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[133] Apple Ephemera "Annual report 1983," 3-4. However, Apple used the graphical interface and the mouse concept in the much larger designed Lisa Computer System. The Lisa cost $10,000 and was relatively unknown due to poor publicity of the computer. As of 2009, the graphic user interface is still widely used in most personal computers.

[134] To save the business, Microsoft executives essentially stole the graphic user interface design from Apple while programming certain software for the Macintosh. Indeed by 1985, Microsoft's Windows operating system was created to compete with the Macintosh operating system and computer. See Martyn Burke, *Pirates of Silicon Valley*, DVD, Directed by Martyn Burke (1999, Los Angeles: Turner Home Entertainment, 2005). See also Paul Freiberger and Michael Swaine, *Fire in the Valley: The Making of the Personal Computer*, 2nd ed (New York: McGraw-Hill Publishing, 2000).

[135] Apple Ephemera, Box 2, Fol 27, Macintosh, Series 3: Product Information, 5.

[136] Ibid, 4.

[137] Burke, *Pirates of Silicon Valley*, DVD.

supposed to be an IBM killer. For the Apple Computer company, IBM was the enemy both in reality and metaphorically. Even Apple's advertisements challenged the IBM PC as being its sole rival for market share dominance. On its 1983 financial report cover, Apple depicted its logo as facing rival IBM's logo above other competitors. The caption stated "the cover graphically portrays the current personal computer industry and the direction it may take in the years ahead."[138] This was an accurate description for the period, and consumers often had the choice between two reliable computer systems, and other inefficient, inexpensive alternatives.

The 1980's became the decade the computer gained acceptance amongst the American public. Computer sales for Apple, Commodore, and IBM reflected America's desire to use computers at home and at work. For example, Commodore sold their millionth computer in 1982, while Apple sold close to one million units alone in 1983.[139] This financial data represented a change of sixty-four percent from the previous fiscal year.[140] IBM, despite competing with a similar price in the high-end computer model market, managed to sell an amazing 200,000 personal computers during its first full year of production.[141] The scope of these numbers revealed a significant amount of commercial success for the consumer electronics industry. Although these companies competed and caused economic problems with their price/value ratio in cutting costs, the developers still managed to bring the computer to the home market. Thus, these companies fulfilled the dreams of their 1970's founders.

The developments of the 1970's and 1980 revealed the significant financial success of personal computers and other electronic devices in the consumer market. Not only did the establishment of personal electronic products become fully accepted during this era, but the

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[138] Apple Ephemera, "Annual Report 1983," Cover Page; 1.
[139] Ibid, 4. See also Tomczyk, 259-260.
[140] Ibid, 4.
[141] Tomczyk, 259.

devices had integrated into the standard mode of production for many business, education, and consumer transactions. The value placed on higher standards of efficiency indeed made the computer the tool of the 1980's. While the consumer electronic industry integrated marketing strategies to show the tools as necessary, companies also decreased prices in order to make their products more attractive to the average buyer. These efforts proved successful and established the devices as relevant within American life. Therefore, 1970's and 1980's consumer electronics that incorporated semiconductors changed the standard mode of production during this era.

Chapter 4: The 1980's, and the Emergence of the Technological Panache

The 1980's became a decade when the personal electronic device successfully integrated with popular culture. From computers to new wave music, the 1980's was the ultimate era of self satisfaction, technological innovation, and artistic creativity. Indeed, 1980's America saw unprecedented growth in the consumer electronic industry that was driven by innovation and economic necessity. Computers, video games, and even cell phones became part of the contemporary lifestyle of many upper and middle class families. Yet the influence the new technological devices had on its users was unprecedented. The 1980's American popular culture saw drastic changes in opinions on materialism, economic deregulation, and individualism. These changes in standards simultaneously shifted when the high-tech industry grew as an accepted and common element in the daily American lifestyle. The similarities between the growth of the high-tech industry and many of the aforementioned 1980's American characteristics are too many to be merely coincidence. The introduction of the computer changed the environments in the workplace, the home, and the entertainment spheres of American society. The workplace particularly saw these changes as increased efficiency in business gave workers more time to concentrate on their own personal lifestyles. From gym memberships to video games, Americans began to accept technology's efficiency value for leisure activities. As a result, the 1980's Me Me Me American cultural phenomenon was influenced from the technological developments of the era.

Yet the time saving element that computers produced provided some of the more intriguing evidence of technology impacting the lifestyles of 1980's America. Lewis Branscomb believed that if computers were operated effectively, the devices could increase overall

individual efficiency by twenty-five percent.[142] Additionally, David Nye, a history professor who specializes in the history of American technologies, commented that the incorporation of computers into the workplace increased productivity in the business sector by three-hundred percent.[143] Furthermore, Nye argued that the acceptance of the 1980's personal computer by the public represented a "disintegration of time and space" in production and information.[144] This statement meant that the all-in-one electronic system essentially created a decrease in work time and organizational space while creating the maximum amount of worker production. As more information and data was processed between employee and employer, the electronic information system vastly increased productivity and became an established production base.

Because of the computer's efficiency value and mobility, workers were able to choose unconventional careers that could not exist without the benefits of high technology. While only twenty-five percent of computers were operated inside the home, many white-collared workers took advantage of the device by moving their assignments to their residence. For example, Louise Priester, a secretary for a local health insurance company, ceased her commute to the office when she decided to move her computer into her home.[145] She discovered that the same paper processing duties she held in her office could be accomplished at her home. In describing the benefits of such a move to newspaper writer Andrew Pollack, she stated "I can get up when I want to and work when I want to" and take care of an elderly mother and children.[146] Moreover, the article mentioned that sociologists thought that computers could potentially transform American society back to a pre-industrial working system where occupations were completed

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[142] Lewis M. Branscomb. "Electronics and Computers: An Overview," *Science*, *215* vol. 215, no. 4535 (Feb. 12, 1982), JSTOR, http://www.jstor.org/stable/1687463, 755.

[143] Nye, *Consuming Power,* 239.

[144] Ibid, 241.

[145] Andrew Pollack, "Rising Trend of Computer Age: Employees Who Work at Home." *New York Times (1857-Current file)*. March 12, 1981, (Accessed February 3, 2009) from ProQuest Historical Newspapers The New York Times (1851-2005), A1.

[146] Ibid.

from the household.[147] If this analysis is true, then computers and other electrical systems altered some of the work settings of the average employee and the overall business system. David Nye argued that the creation of the computer meant that leisure time became work, because more people had to perform their job duties in both the office and personal sphere.[148] Indeed, he stated that in the 1990's, newly hired individuals would have to work fifty to sixty hour work weeks.[149] Nevertheless, these increased hours represented economic competitiveness as a major ideal amongst the individual worker, as the computer became a useful tool for self improvement and promotion. As a result, the computer industry threatened to change some of the conventional aspects of the American industrial society.

With expendable amounts of time due to the personal computer's accessibility, computer clients used their leisure time to concentrate on their own aspirations. In the 1980's, one of the many fads that came out of having efficient computers was the development of exercise and jogging programs. According to Nye, these jogging programs were used by workers to achieve a "biochemical high" for personal satisfaction, with some businesses even building exercise rooms at their offices as an appealing employee benefit.[150] Some fitness coordinators of the time even alluded to the idea that joining a fitness club was the equivalent of participating in executive competition and success.[151] Because of the competitive drive between employees, gym companies often set their membership rates between 1,300 to over 3,000 dollars a year.[152] As a result, success in the 1980's seemed to be measured by not only individual materialist

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[147] Pollack, "Rising Trend of Computer Age," A1. The Pre-industrial hierarchy was set up in a way where merchants constantly produced goods and services from within their home. An example of this type of pre-industrial economic system could be the average embroiderer, who before the advent of the textile mill, would produce clothes at home and sell them on an open market in a nearby urban center.

[148] Nye, *Consuming Power,* 241.

[149] Ibid, 244.

[150] Ibid.

[151] Linda Wells, "Revving Up" *New York Times (1857-Current file)*. February 15, 1987, (Accessed February 3, 2009) from ProQuest Historical Newspapers The New York Times (1851-2005), SM58.

[152] Wells, SM58. These prices were set to make a gym membership a luxury.

possessions, but also the overall leisure lifestyle quality. Exercise increased in popularity because society had more leisure time due to the time-saving efficiency produced from computer systems.

Ironically, many of the exercise devices used by the executives were incorporated with the same computer technology used within the office. As a result, many participants could not escape their devotion to computer devices. Individuals that depended on efficient means of accurate and immediate statistics needed treadmills, bikes, and weight machines to convey their statistical progress in their workouts.[153] Since computer owners demanded perfection from their own production devices, they additionally needed the same type of absolutes in their exercise routines. This type of sense of perfection transcended over to the exercise community once statistics were provided electronically to the user. Therefore, the increase in gym membership was likely due to the exercise machine's increased efficiency in calculating an individual's progress. These made exercise machines a valuable and sought after commodity for white-collared employees.

Other than the development of exercise programs, computers additionally created faster outlets that made leisure more efficient. Games such as *Pong* and *Star Trek* offered owners quicker methods to expend time away from work. The Atari Corporation, which produced the game *Pong* where users would bounce a ball between two paddles until one user would miss, purposely offered the arcade game at airports, restaurants, malls, and the computer so that the user would have access to the entertainment source in both public and private areas of life.[154] Hence, consumer electronics were not only used as a workplace tool, but an entertainment

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[153] Wells, SM58.

[154] Atari Business Plans 1974-1975, Box 1. However, by 1983, Atari had started to degrade as a company. After they were bought by Commodore in 1983, Japanese game maker Nintendo took over as leader of video game design and production. The rise of Nintendo meant the demise of Atari. See *Nintendo v. Magnivox* (1986), Stanford University Special Collections, Call M1489, Box 1.

product as well. While before, individuals may have interacted with entertainment by participating in mass cultural experiences in movie theatres and sporting events, the video game allowed its participants to undergo a private and reclusive relationship with a machine. This relationship became concrete when individuals saw the video game as their own perfect entertainment source. Sherry Turkle commented on this phenomenon in which human behavior suddenly embraced the idea of perfection. Turkle saw that many people who played video games sought a type of perfection; meaning that individuals knew the only method to defeat a video game was to be the flawless, perfect user. Turkle specifically cites a player named Jimmy who felt himself "becoming 'perfect' and calm" because of the consistent response from the game.[155] This partaking of a particularized entertainment source only added to the unique individuality and Me Me Me experience that many embraced in the 1980's. As a result of high-technology's incorporation into the 1980's American society, individuals developed narcissistic behaviors due to increased efficiency and leisure ability.

Because the consumer electronic industry served a mostly professional type of class, the entertainment industry made many high-technological products synonymous with the powerful elite. An example of linking innovative technologies to elitism was clearly seen in the 1987 movie *Wall Street*. While the movie portrayed the antagonist character, Gordon Gecko, as a malevolent and corrupt business entrepreneur, he constantly surrounded himself by technological innovations that measured his level of economic status.[156] In this movie, Gecko was seen using multiple IBM PC's which subsequently issued real-time stock quotes and charts. In one scene of the movie, Gecko listens to a managerial investor as he simultaneously buys and sells stock

[155] Turkle, 86.
[156] Stone, *Wall Street*.

shares using insider trading.[157] The faster Gecko bought stocks and received information, the more money he potentially manufactured. Not only did this scene reveal the financial productivity of the device, but it additionally linked the powerful businessman persona with traits of greed and corruptibility. The director's inclusion of these devices essentially enhanced the character development of Gecko.

The technologic impact on upper-class behaviors was explored further in *Wall Street* when Gecko called one of his inside trading partners from the newly developed Motorola DynaTAC 8000X cell phone---otherwise known as the brick phone. On this large phone, which was breakthrough for the era, Gecko reminds the movie's audience that "money never sleeps."[158] Since Gecko represented the ideal ruthless businessman within the film, he needed the cell phone to have instant contact with any of his financial partners and clients. However, the phone was not entirely necessary in the film.[159] By incorporating the mobility of the first cell phone as part of the technological theme of the film, the film's writer and director leave the audience with the impression that along with fast cars and large houses, high-technology was additionally part of the elitist excess lifestyle.[160] Therefore, technology officially became an element of popular culture's conceptions of 1980's success. Society's use of technology as a measure of prominence, symbolized an important transition to the materialist lifestyle that created a new level of overindulgence.

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[157] Stone, *Wall Street*.

[158] Ibid. The Motorola DynaTAC 8000X cell phone, while a symbol of the culture's desires for efficiency, was ineffective as a product. The expense to make a phone call on the first cell phone was outrageous, and cell phone coverage was limited to only urban areas. The length of the phone was about the size of a human head and was about four inches thick. However, the invention of the phone was significant since in theory, individuals could send a verbal message instantaneously with no limitations concerning time and area.

[159] Ibid. I believe that the scene where Gecko calls from overseas represented a chance to glamorize the luxury of owning a cell phone. The scene was not necessary or crucial to plot, character, or setting of the movie. Yet the phone represented the competitive drive of Gecko and the idea that technology created the opportunity to create wealth anytime and anywhere.

[160] Ibid.

Although *Wall Street* clearly revealed that technology was part of the 1980's culture of affluence, government data that charted consumer spending clearly showed that the 1980's became a decade of unnecessary spending. In January 1980, consumers spent an average $3,429.90 in a month. However, by December 1989, this number increased to an average of $4,745.80.[161] These numbers are unprecedented because within that same period, expenditures spent on non-necessities increased from approximately forty percent to fifty percent, while leveling off at fifty percent throughout the 1990's.[162] Additionally, within these expenditures, there were significant increases in consumer electronic purchases between the years 1982 and 1987. For example, computer purchases increased by seven-hundred percent, while home video recording purchases increased by almost five-hundred percent.[163] The increase of money spent on consumer electronics drastically revealed the importance of electronics as a material good in the 1980's. Since competitive self improvement was an established theme during this era, the collection of luxury consumer electronics such as computers and video recorders became an effective method to measure personal dominance. These innovative technologies only added to the popularity of rampant consumerism and individualism that the 1980's represented in popular culture.

Yet other than computers and video games, the video recording device and video cassette player additionally created an environment of self-admiration. Indeed, the Video Home System (VHS) and BetaMax video players were another 1970's technological development that

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[161] "U.S. Real Consumer Spending—Recent History." *St. Louis Federal Reserve.* January 20, 2009 (Accessed on January 30, 2009.) http://www.data360.org/dsg.aspx?Data_Set_Group_Id=2039.

[162] "Bureau of Labor Statistics: Office of Publications and Special Studies" *100 Years of U.S. Consumer Spending* (2006). Accessed on January 30, 2009. http://www.bls.gov/opub/uscs/1984-85.pdf. The inclusion of 1990's spending habits alludes to the idea that materialistic and overindulgent behaviors continued past the 1980's decade. Additionally, the 1980's was not the sole era where Americans encouraged materialism. Indeed, the 1920's and 1950's American society also showed a broad acceptance of materialistic economic values. These eras also share a similar sociotechno correlation between the introduction of several innovative products and materialism.

[163] Maureen Gray, "Consumer Spending on Durables and Services in the 1980's," *Monthly Labor Review*, May 1992, 19-20.

transcended into 1980's consumer spending examples. Individuals who owned a television set and a video player recorded and possessed their own personal copies of movies and television shows without paying entertainment companies fees. Although consumers would still have to purchase the actual tape, which cost around thirty dollars in 1977, they could essentially record personal programming for free.[164] Movie production companies like MGM and Paramount, realizing that they were missing out on an important revenue stream, decided to sell video copies of their movies either on cassette tape or the flourishing pay-per-view cable system.[165] Barry Diller, a Paramount Pictures executive, commented that the acceptance of pay-per-view and video cassettes reflected upon the materialistic mentality of the "I own the product, they have to use it" attitude.[166] Indeed, statistical data from the 1980's proved that the development of the cassette filled a consumption niche. In 1980, consumers reported spending collectively six million dollars on Videocassette disks and recording devices. This number subsequently rose to twenty-three million dollars in 1982 and then to sixty-one million dollars by 1985.[167] These exponential sales increases represented a social acceptance of the video recording technology in the 1980's. The transcendence of the movie, from the public theater realm to the private home, provided consumers with the ability to touch, visualize, and possess a product that was seemingly owned by the individual and not corporate film giants. The development of the cassette filled consumer ownership desires and resulted in the enhancement of the materialistic lifestyle of the 1980's.

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[164] Joshua Greensburg, *Beta Max to Blockbuster: Video Stores and the Invention of Movies on Video*. (Cambridge: MIT Press, 2008), 13. Greensburg additionally wrote on the development of the video rental business. As stated earlier, video cassettes cost thirty dollars for purchase. However, video store chains offered movie rentals for as low as three dollars. This substantially produced more rentals than video purchases, and allowed the movie industry to set up a movie distribution hierarchy similar to their conventional movie theater partnership.

[165] Aljean Harmetz, "Hollywood's Video Gamble" *New York Times (1857-Current file).* Mar 28, 1982. ProQuest Historical Newspapers The New York Times (1851-2005). pg SM40.

[166] Ibid.

[167] Gray, 19; 22.

The introduction of the video camcorder to the public market additionally enhanced narcissistic individual behavior. The video camcorder allowed individuals to document their life into a movie. Through their personal interaction with the camera, consumers became the stars in their own historical documentation. Video cameras were not a new concept for Americans, as many of their favorite television shows and movies were developed using camera technology. However, unlike the mega cameras involved to film movies and television shows, the personal camera of the 1980's was fairly small at about 1.5 feet in length. From attending weddings to watching toddlers take their first step, the video camcorder could document the most important events of an individual's life.[168] Neal Gabler commented on such a narcissistic phenomenon in his book, *Life: The Movie*. Gabler argued that technological developments within media and consumer products psychologically consumed the American society during the 1970's and 1980's. Indeed, Gabler intriguingly stated that American society behaved as if they were in a movie.[169] A society that was falling into the trap of narcissistic behavior would utilize the camera as essential in fulfilling their philosophically centric personalities. With a camera, individuals became important and became actors of their own reality. Americans even elected an actor, Ronald Reagan, as their President throughout the 1980's. For Gabler, Ronald Reagan represented the ultimate merging of entertainment and reality.[170] Thus the creation of the personal camera cultivated the individual sense of importance.

While the incorporation of technology indeed impacted individual behavior, innovative devices also nourished artistic creativity. Indeed, in the early 1980's, popular culture became heavily influenced by the materialistic aspects of consumer electronics and saw innovative

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[168] Neal Gabler, *Life: The Movie-How Entertainment Conquered Reality* (New York: Vintage Books, 1998), 234

[169] Ibid, 234-235.

[170] Ibid, 109-110.

technology as chic. Specifically, the popular New Wave music genre incorporated synthetic sounds made from electronic keyboards and personal computers in order to define a new era of music culture. The music videos of this particular genre utilized surreal images in an acknowledgement of the more pseudo aspects of their music. Perhaps the music group Devo represented the most successful incorporation of new technology into their own musical performance. Devo's song and music video "Whip It" incorporated surreal visuals from red plastic pyramid hats to their whipping off clothes of a manikin dressed woman.[171] Additionally, there are some extremely odd visuals in "Whip It" that do not necessarily match the song's lyrics such as the crossed-eyed shooting of an aluminum can off of a band members hand, or the prepping of food by the band's fictional mother.[172] The actual music contains mostly synthetic instruments composed of computerized drum beats with electronic keyboards.[173] Because the music of Devo and the New Wave genre was created from high-tech electronic instruments, innovative technology changed how music was imagined.

Yet Devo's sound was not the only example of computer technology's influence on music. Other New Wave songs such as "Obsession," "Money," and "Video Killed the Radio Star" captivated the youth of the 1980's.[174] These songs, which also utilized surreal and neurotic images in their music videos, sponsored affluence as a major theme. These music videos incorporated pseudo-sounds and inhuman behaviors in order to mix visual art, entertainment, and

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[171] DEVO, "Whip it," *Freedom of Choice*. Warner Brothers, 1980, Music Video.
[172] Ibid.
[173] Ibid.
[174] Animotion, "Obsession," *Animotion* (New York: Mercury Records, 1985), Music Video. See also Flying Lizards, "Money (That's What I Want)," *The Flying Lizards* (London: Virgin Records, 1979), Music Video. See also Buggles, "Video Killed the Radio Star," *The Age of Plastic* (New York: Island Records, 1979), Music Video. The Buggles' album was called *The Age of Plastic*, a reference to the synthetic and artificially created substance of the era. The "Obsession" music video featured a prominent mansion, clothing, and swimming pool, while the band members changes quickly out of clothing. "Money" was originally a 1959 song that was covered by The Flying Lizards in 1979. The song is performed in an emotionless, mechanical style that utilized new wave synthetic sounds.

technology on a contemporary and fashionable level. Entire channels were created to gear towards this new development of the music video. When Music Television (MTV) began to operate in 1981, they challenged their audience to seek music and art from areas other than the radio. While the majority of music videos were seen only in dance clubs before its creation, MTV offered cable channel viewers access to twenty-four hours of videos representing the surreal popular culture of the decade. Their first presented video, titled "Video Killed the Radio Star," was a symbolic acknowledgement of the music torch being passed from radio to television.[175] These songs represented a combined form of visual art and musical art to create a powerful message to their audience. Many of the songs that were popular utilized computerized sounds as a major aspect of the musical number.

Yet many musicians saw the negative cultural changes as a result of technology. The interaction between technology and an individual created a fundamental concern that the human experience would be forever lost to the cold efficiency of a machine. Styx criticized society's reliance on technology by holding contempt for computer and robotic production in their 1983 song "Mr. Roboto." One of the lyrics in the song interestingly stated "The problem's plain to see: too much technology. Machines to save our lives, machines dehumanize," to illustrate the point that high-technology does not always indicate human progress.[176] The song, which reached third on the billboards chart of top 1983 hits, held incredible relevance during this time.[177] Other songs, such as 1982's "She Blinded me with Science" by Thomas Dolby, attacked psychology, science, and technological progression all in one song. During the music video, Dolby included a reference to his distaste for the dehumanizing aspects of progress by stating

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[175] Hilburn, G1.

[176] Styx, "Mr. Roboto." *Kilroy was Here*. A&M, 1983. Music Video.

[177] "The Billboard Hot 100: Mr. Roboto," *Billboard*, http://www.billboard.com/bbcom/esearch/chart_display.jsp?cfi=379&cfgn=Singles&cfn=The+Billboard+Hot+100&ci=3071257&cdi=8908058&cid=06%2F11%2F1983, (Accessed January 30, 2009)

"Mr. Dolby rejects science and things scientific," which produced a strong message of anti-modern intellectualism.[178] Ironically, the song incorporated only electronically produced music, which made it particularly hypocritical.[179] Yet the New Wave sound of the song allowed it to climb to the number five spot on billboard's ranking chart for 1983.[180] The popularity of these anti-technologically themed songs was not necessarily surprising since most individuals accepted the presence of technological tools found in their homes, offices, and schools.

The same surreal themes found in many of the 1980's music videos were also seen in several movies. Movies of the early 1980's reflected themes of both acceptance and denunciation of personal electronic tools. Movies such as *Short Circuit,* and *Revenge of the Nerds* supported plotlines where technology became a significant part of the human story. 1984's *Revenge of the Nerds* specifically followed a group of freshman college students and their creation of a fraternity house. However as the title suggested, these students did not necessarily engage in socially acceptable behaviors, but rather took interest in their personal technology, trivial knowledge, or careless appearance. The "Nerds" become the protagonists in a story about intellectual righteousness succeeding over conventional athletic popularity. One scene in particular related to the personal electronic culture that was forming during this decade. In one scene that pit the Nerds against the "Jocks" of the college, the Nerds performed a DEVO styled concert in which lasers, synthetic sounds, and computers were all used to successfully win over the student crowd. The performance was a message to the audience saying that the New Wave

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[178] Thomas Dolby. "Blinded Me With Science." *The Golden Age of Wireless*. Capitol Records, 1982. Music Video.

[179] Ibid.

[180] "The Billboard Hot 100: She Blinded Me With Science, *Billboard*. July 16, 1983. http://www.billboard.com/bbcom/esearch/chart_display.jsp?cfi=379&cfgn=Singles&cfn=The+Billboard+Hot+100&ci=3071262&cdi=8908578&cid=07%2F16%2F1983. (Accessed January 30, 2009).

music sound represented the movie's "nerd" culture, and therefore the 1980's generation had themselves become "nerds."[181]

The 1986 movie, *Short Circuit*, presented a family genre plot-line that focused on a military robot that unexpectedly becomes a benevolent, independent, and self-conscious entity. In addition to these human qualities, the machine displayed personal emotion and its own realization of its own existence.[182] The movie was meant to be a comedy for a family audience, but also looked at human relationships with innovative manmade technologies. In this film, technology became the protagonist of the film, as audience members cheered on the spirit of a machine made of nothing but inhuman metal. The realization that a war machine could rebel against its own programming and create a cognitive existence became a celebrated feature in the film because of the possibility that machine and man could peacefully co-exist. Personal electronics of the time period were ideally seen in this light since they were manufactured as efficient tools that helped humanity. Therefore, the movie's contemporary optimism towards the personal machine and human relationship was familiar to the audience.

The optimism that *Short Circuit* and *Revenge of the Nerds* envision does not mean that movies did not represent warnings and precautions against the era's development of high-technology. Movie producers also created films such as *Blade Runner* and *The Terminator*, which brought to the screen a bleak futuristic world, ruined by humanity's own technological dependence. 1984's *The Terminator*, created at the same time as *Revenge of the Nerds*, hypothesized that humanity would be involved in an apocalyptic war against their own mechanical devices in the near future. One of the machines was sent through time to the year

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[181] Jeff Buhai, *Revenge of the Nerds*, DVD, Directed by Jeff Kanew, (1984; Tuscon: Interscope Communications, 2001).

[182] S.S. Wilson and Brent Maddock, *Short Circuit*, DVD, Directed by John Badham, (1986, Oregon: David Foster Productions, 2008). The movie context presented as evidence was from 1986. The 2010 remake of *Short Circuit* was not included within this essay.

1984 to kill the future leader of human resistance.[183] However, the conflict of machine versus humanity was a relatively straightforward message for the audience to comprehend. The idea that machine could potentially become sentient and knowledgeable through the innovative progress of humanity and subsequently destroy man, was an intriguing idea in a 1980's era when technological growth was celebrated. *The Terminator* was coincidentally released the same year as the Macintosh computer, which was programmed to speak and interact with the user through certain programming.[184] This function, known as text-to-speech, not only helped individuals with poor eyesight, but was an attempt by Apple to make the machine more human. Indeed, pessimistic filmmakers saw the dangers of creating machines in our image. *The Terminator* represented the worst that could happen when humanity entrusted itself with their highly advanced technological tools. The film additionally gave a warning to the 1980's audience that too much technology increasingly encroached on humanity's own survivability.

1982's *Blade Runner*, another movie that looked into humanity's future pessimistically, incorporated innovative technology as a problematic issue throughout the film. *Blade Runner* was a neo-film noir detective story that portrayed a polluted downtown Los Angeles as being heavily altered by urban sprawl and technological development. In the film, the protagonist attempts to find four renegade artificial life-forms that challenged their human creators'

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[183] James Cameron, *The Terminator*, DVD, Directed by James Cameron (1984, Los Angeles: Hemdale Film, 2001).

[184] Apple Ephemera, Box 2, Fol 27, Macintosh, Series 3: product information, 6. Of course the computer was not sentient and was merely repeating the words typed by the user. Apple incorporated this feature in an attempt to help individuals with eyesight deficiencies. Nevertheless, the technology does represent an attempt by the computer's designers to make the machine incorporate more humanist qualities.

authority.[185] Other than the clear human vs. creation antagonism, the movie additionally sought to show humanity's menial existence caused by a society that is reliant on synthetic tools of production. All consumer objects such as children's toys, animal pets, and sexual objects were synthetic in the *Blade Runner* future. The movie's sky, constantly covered as the result of a destroyed world suffering from the consequences of an urban and technological environment, represented the dire consequences of humanity's "progress" in industrial development. This incredibly dark scene is complemented by flying cars and hovering neon advertisements. Ridley Scott, the director of the film, purposely denied any colors that resembled a natural environment, to focus on the dehumanized aspects of a highly industrialized society.[186] The *Blade Runner* society had become an urban nightmare, devoid of any plant or animal life, but filled with a synthetic existence for both artificial life-forms and humanity.

Blade Runner and *The Terminator* both presented human versus mechanical conflicts throughout their storylines. However, they only worked in sustaining an audience if these conflicts took place in the future. Films that incorporated the 1980's time period as a setting, such as *Short Circuit* and *Revenge of the Nerds*, showed personal electronics in a positive light because high technology was familiar to an audience that used technology daily. The average 1980's era American would see the computer as being a harmless and nonthreatening "costly

[185] Hampton Fancher and David Webb Peoples, *Blade Runner*, DVD, Directed by Ridley Scott (1982, Los Angeles: Warner Brothers Studio, 1997. Researchers looking for a movie on the hypothetical existential realities of both mechanical recreation and the human experience would find *Blade Runner* an intriguing movie. Ridley Scott has recently revealed in the DVD commentary that the protagonist, the bounty hunter of the synthetic life-forms, was actually a replicated being. This revelation means that Scott created a setting where inhuman technology literally murders itself.

[186] Ibid. See also Philip K. Dick, *Do Androids Dream of Electric Sheep?* (New York: Del Rey Books, 1975). The dark future visualized in the movie *Blade Runner* came from Dick's 1968 book. However the book deals more with nuclear apocalypse than hypo-technology. Significantly, the characters in the book are asked repeatedly to escape to a created lunar utopia rather than stay on a deteriorating Earth. Only those suffering from mutations are asked to stay behind to live on a planet that had been destroyed by human progress.

toy" or "fantastic helpmaker," and not necessarily the means for their own destruction.[187] Therefore, this pessimism towards high-technology's role in the human experience was only the result of fictional interpretations of the future. Nevertheless, the introduction of consumer electronics created a sense of unease among some filmmakers and audience members because of advanced technology's inhuman characteristics.

The 1980's political sphere was additionally affected by American materialist and privacy movements. President Ronald Regan was elected in 1980 on the idea of less government interference and more private responsibility. This idea, along with his proposals of massive industrial deregulation and trickle-down economics, appealed to a sufficient amount of Americans to get him elected twice and serve as president until 1988.[188] Trickledown economics, otherwise known as "Reaganomics" and supply-side economics, gave tax breaks to the American upper class while giving government grants to healthy industrial powers in the hopes that wealth would eventually descend to the rest of the population.[189] Reagan endorsed this economic idealism during his election as part of his economic revitalization plan for the United States. The economic proposal was popular because the plan celebrated the upper class's individual success while demonizing the working poor who accepted welfare. Many still believed that individual hard work led to upper class success.[190] Presumably, issues of individuality and consumer choice likely influenced voters to choose Reagan. Thus, the election of Reagan was the result of America's support for materialism and exceptionality during this era.

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[187] Leland Greenleaf, "Banks for the Memory," *Los Angeles Times(1886-Current File)*, Mar 30, 1982, ProQuest Historical Newspapers Los Angeles Times (1881-1986), I1.

[188] Michael Schaller, *Right Turn: American Life in the Reagan-Bush Era, 1980-1992* (New York: Oxford University Press, 2007), 46-47. I am aware that economic righteousness was not the only platform that allowed Reagan to win. The previous president, Jimmy Carter was largely unpopular because of economic hyper-inflation and his poor knowledge of diplomatic policy.

[189] Ibid, 35-36.

[190] Schaller, 42. This concept might still be true in the contemporary era. However, I believe that capitalism still promotes a type of caste system where individuals are born into a developmental future based on their family's class level.

If innovative high-technology such as computers did change the mode of production for Americans during the 1980's, then the subsequent changes in consumer culture were the results of innovative technologies' unintended consequences.

The development of consumer electronics such as computers, video games, and cell phones were created to increase the productivity and efficiency of the American employee. Yet these devices turned into status symbols as they became synonymous with materialism and elitism. Because technology offered escapism for Americans in this era, the 1980's reflected the tools' inhuman attributes. The era's popular entertainment reflected the synthetic decade through pseudo music, videos, and movies, while incorporating the ultimate symbol of inhumanity, the internal-component electronic device. There was no doubt that 1980's consumer electronics changed the method for production and left a lasting impact on the American socioeconomic system.

Chapter 5: 1970's and 1980's High-Technology as a Base and Superstructure Example

As stated earlier, this essay's intention was to reintroduce base and superstructure rhetoric back into the history of technology and society subfield. While this topic could certainly be expanded into a larger manuscript that focused on other historical examples, the scope of this essay was to look at the socioeconomic impact consumer electronics had on the 1980's American upper and middle class culture. This chapter seeks to show that the 1970's change in technology did indeed trigger a 1980's superstructural change. Technology has been defined as a tool that encouraged production within a society. Marx used examples of the hand-mill and steam-mill to show the technological change affecting production methods within a culture.[191] 1970's and 1980's high-tech consumer gadgets additionally placed alongside these examples of revolutionary products that changed socioeconomic production modes. Specific cultural aspects prevalent during the 1980's revealed that a base and superstructure example indeed existed during this era.

Marx and Engels identified technological influence on the social superstructure by exploring "material production" effects on the socioeconomic hierarchy within societies.[192] These material production consequences were explained further when Marx and Engels stated in the *German Ideology*:

> Conceiving, thinking, the mental intercourse appear…as the direct efflux of their material behaviour…applies to mental production as expressed in the language of politics, laws, morality, religion, metaphysics, etc. of a people. Men are the producers of their conceptions…as they are conditioned by a definite development of their productive forces… material production and their material intercourse, alter, along with their real existence, their thinking and the products of their thinking.[193]

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[191] Heilbroner, 54.
[192] Marx and Engels, 46-47.
[193] Ibid, 47.

Through this rejection of the idea that man's history was created through personal consciousness, Marx and Engels argued that production defines the consciousness of an individual.[194] As a result, any significant change in a society's mode of production would significantly alter what Marx and Engels considered the "mental production" of social behaviors within a society.[195]

When placing this theory into the context of 1980's American behavior, technological references became crucial in implementing the Marxist dialectic. The consumer electronic developments of the 1970's and 1980's indeed changed moral, political, and socioeconomical aspects of American society. Since consumer electronics became widely accepted in the United States by the 1980's, changes within the base mode of production were clearly evident. The amount of efficiency gained through the use of these products within the home, business, and educational spheres of the American lifestyle proved that the implementation of personal high-technology became a central production activity.

This change in mode of production for Americans had drastic consequences on cultural and psychological aspects of 1980's American behavior. Changes of moral behavior were clearly evident from the narcissistic attitudes that many individuals displayed in the 1980's. The introduction of computers, video games, and video recorders all focused on an individual relationship with the mechanical tools of production. The culture of self-gratification and self-improvement, created a competitive work environment based on efficiency and perfection. Additionally, the drive for individual success meant that the 1980's individual needed to show class status through the purchasing of consumer electronics and other luxurious products. This meant that the economic characteristics of consumerism and materialism became a central theme during this era. Because individual success and acquisition of capital was glorified alongside

[194] Marx and Engels, 47.
[195] Ibid.

innovative technology, Americans elected political leaders that catered to upper class economic demands. From moral, political, and economic behaviors, innovative products influenced American cultural ideas.

Yet Marx also demanded significant change in a society's socioeconomic hierarchy and division of class labor. Indeed, the customers of the 1970's and 1980's personal products were largely from the upper and middle class, with the working class unable to purchase the luxurious devices. Because of the upper class access to the greater organizational tool, the income disparity between the lower and upper classes became the highest in American history. For example, the lower twenty percent bracket for income earners saw their earnings fall fifteen percent for the duration of the 1980's decade. Conversely, the number of American millionaires more than tripled from 450,000 in 1978 to 1.5 million by 1988, while the top five percent wage earners in the nation grew their incomes by forty-five percent.[196] Such an income disparity was directly related to the efficiency gained from the use of technological tools and the political incentives given by a capitalist-minded, Reagan administration. The nation, in essence, returned to a hyper-capitalist stage of industrial production, where the rich expanded their incomes at the expense of working class deprivation. The disregard for the working class, and the rewarding commemoration of the consumer culture was the prevailing result from changes in technologically efficient production standards.

The entertainment industry and the arts revealed the psychological effects of the introduction of these new technologies. America's electronic arts, seen within the context of

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[196] Steve Kangus, "Income and Wealth Inequality," *The Reagan Years: A Statistical Overview of the 1980's*, (Last Updated, 1996) http://www.huppi.com/kangaroo/4Inequality.htm. Although an internet site, Kangus was a economist, dissertation candidate at UC-Santa Cruz. His website was award winning, and he cited the data from Internal Revenue Service, *The Politics of Rich and Poor* (New York: Random House, 1990), Appendix A, p. 239, and Thomas J. Stealey, *Marketing to the Affluent* (Homewood, Ill.: Dow Jones-Irwin, 1988). Tragically, Kangus committed suicide in 2000, but his presented data has been helpful to sociologists, political scientists, and historians.

popular movies and music, showed that technology developed the relationship between entertainment and efficiency. Since the popular new wave music genre focused on the establishment of the pseudo-sound, technology represented the ultimate form of avant-garde expressive behavior. Art was perceived as encompassing any form even in the unnatural technological wonders of synthetic sound and visual special effects. Indeed, Humanity's necessity to pull a string or blow into a steel frame was instead replaced by an individual pushing a button to produce an artificial sound. These new methods of creativity challenged the realist approach to art and replaced it with creative simulation.

In the 1920's, Walter Benjamin mentioned that the emergence of mechanical reproduction held important repercussions for mass culture of the period. Furthermore, Benjamin argued that the 1920's mechanical reproduction of film and art allowed all classes to purchase and experience the once luxurious value of certain creativity forces. Specifically, the development of large movie houses and radio allowed for class divisions to be blurred as both the bourgeois and the proletariats were granted equal access to mass entertainment sources.[197] Benjamin hoped the collective classes, experiencing the same entertainment, would create revolutionary, social thought that would eventually lead to the end of class division.[198] If personal computers, video games, and other electronic devices were processed in a similar fashion but instead created a one human/one machine relationship, what would be the consequence of Benjamin's 1920's mass culture argument? Essentially, a user's personal relationship with their electronic entertainment tools created a unique culture experience amongst each user. Video games produced for consoles and computers offered the best

[197] Walter Benjamin, "The Work of Art in an Age of Mechanical Reproduction," in *Europe between the Wars*, edited by Martin Kitchen, 2nd ed, (New York: Longman Publishers, 2006), 417-419. Before the introduction of photographic technology , the upper class often held a monopoly on the arts as tickets were purposefully inflated to keep working class individuals attending shows.

[198] Ibid, 416; 418-419.

examples of this type of individualized entertainment experience. While each video game customer owned the same program, each user would experience a different sensation. Rather than merely listening or watching a program in mass groups, video games relied entirely on the integral relationship between the player's individual skill level and program design. This association meant that each user's experience differentiated from other players.[199] Benjamin's vision of collective class consciousness fundamentally became obsolete with the establishment of individual interaction with entertainment sources.

Because of the reclusive nature that video games provided for individuals, distinguishing between leisure and labor periods became increasingly difficult. Michael Tomczyk revealed that his personal connection with an electronic device had an addicting type of quality. Since each interface was essentially different, Tomczyk interacted privately with his first gaming system for twelve hours a day. The time invested in video games made a tool of leisure and entertainment into a lengthy exercise. Indeed, Tomczyk became so addicted he quit his occupation as a journalist to pursue a career in the new high-tech industry.[200] This type of addiction was analyzed by Sherry Turkle who thought that individuals were attracted to video games because of the intimate perfection that video games presented.[201] Consequently, such time spent towards what was supposed to be an efficient means of relaxation, instead became work and represented a unification of leisure and labor periods.

Since every user had a unique experience with a computer or video game, the mass culture phenomenon began to revert back to a form of individual consciousness. Although mass

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[199] As of 2009, video games are compatible with the internet. The internet allows for games to suddenly be shared in an online world, where users experience the same visuals. However, in the 1970's and 1980's, this technology had not yet been developed, and users played either by themselves or with another physical person in private multiplayer competition.

[200] Tomczyk, 3-5.

[201] Turkle, 86.

cultural tools such as movies were still widely available in the 1980's. The acceptance of video games created a human and machine relationship that contributed to narcissistic behavior. An example of this change could be seen with changes in social thinking between the 1960's and the 1980's. While the 1960's was seen as a time of liberalism and shared economic growth between the masses and the elite, the 1980's instead celebrated personal acquisition of wealth and achievement. Materialism, consumerism, and massive wealth were icons within the 1980's because of America's emphasis on individual success. Therefore, devices that used internal components were highly popular because of their efficiency value and narcissistic qualities. The tool that would fulfill the American desire for self-love *had* to be the personal machine because of its private interface.

These social consequences that 1970's and 1980's technologies induced, gave credence to the base and superstructure idea that Marx and Engels contemplated. While these devices failed to progress Marx's socialist future, they instead enhanced the competitive aspects of capitalism. The changes seen in the 1980's quality of life between the classes was important to note. The superstructure theory was not meant to merely show that a change in technology would progress Marx's economic history argument. Instead, the theory was a constructive idea meant to show the consequences of technological change within material production and class identity. If the acceptance of personal high-tech electronic tools indeed infiltrated American business, households, and educational institutions, then the popular culture changes seen within 1980's entertainment and livelihood behavior were highly related. As a result, the change within 1970's and 1980's technological base and mode of production indeed transformed the American 1980's superstructure.

Conclusion

This essay's focus was to look at the development of 1970's and 1980's consumer technology and show its effects on American cultural behavior. Yet this essay also attempted to bring a criticized philosophical model back into the intellectual community by explaining the macro-level changes seen during a technologically enhanced era. By exploring the transformations seen in business, entertainment, education, and the private household, this essay revealed the significant behavioral developments influenced by certain innovative technology. Through the use of movies and music, the essay looked at technology's influence and integration into 1980's popular culture. Yet the existence of these developments would fail to exist without the economical processes that brought internal components and innovative technology to the public market. From its establishment as a mode of production, to its subsequent transformation of cultural behaviors, 1970's and 1980's technology served as an important example of the base and superstructure relationship.

Current contemporary technology fits particularly well with Marx's and Engels's base and superstructure theory because of the wide accessibility of personal electronic devices to all economic classes. Indeed, much of the working class now incorporates technology as a necessary device for organization, communication, and entertainment. Technologies that incorporate internal components are prevalent throughout the current society, and are necessary for everyday functionality. The extensive growth of mobile cell phones and internet connectivity changed entire methods of American communications. Because this essay utilized base and superstructure theory to explain the transformations seen in the 1980's, perhaps the same theory could be applied for more contemporary social behaviors. Indeed, with the development of the

internet and social networking sites, individuals no longer have a private relationship with their machine.[202] Instead, the internet has transformed American society back into the mass culture relationship that Walter Benjamin visualized. The internet resulted in the replacement of printed and physical mechanical reproduction with digital and electronic duplication for all classes to utilize. Users of contemporary technology need only internet access to have instant educational, artistic, or entertainment materials. This type of accessibility is not found among an elite few such as seen in earlier periods, but across many nations, cultures, and classes. Since personal technology has become widespread, the establishment of a collective, classless consciousness may become reality.

Conceivably in the coming years, intellectuals will incorporate more base and superstructure philosophy as a method of explaining significant changes in a community's culture. Certainly the opening up of inexpensive consumer electronics to the lower classes offers significant opportunities to study the psychological and economical consequences of equal access to communication and efficiency tools. While class boundaries still exist within different levels of technological efficiency, all classes incorporate some type of electronic device for daily use.[203] If Marx was correct in assuming that changes in material technology affect behaviors and beliefs of a society, then what will the future hold for a community of nations that incorporate these new high-tech tools as consumer products? Would such an acceptance of technology on a broad global level create the same conditions of American 1980's narcissism within entire communities, nations, and continental regions? If so, how would these nations cooperate if narcissistic styled nationalism becomes a central foreign policy position? These questions

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[202] Social networking sites are personal pages where users track their friends and family through profile status updates. Examples include Facebook, Myspace, Twitter, or any site location that incorporates a profile system.

[203] The price of a consumer electronic device is related to the efficiency value of a device's speed, size, and memory power.

should be left to researchers studying the contemporary period or for future historians in the decades to come. However, within their answers, the base and superstructure theory should be used to examine the relationship between technology and society.

In addition to the use of the base and superstructure theory, the essay cited important changes within economic sectors as spurring innovation. The highly competitive semiconductor sector and their multiple recessions throughout the 1970's became the economic foundation for the personal electronic revolution to occur. The evolutionary miniaturization progressions of the microprocessor allowed for personal computers to be built and sold inexpensively while obtaining a feasibly manageable size. Additionally, the development of a practical microprocessor allowed the development of the practical use of electronic devices in the home, work-place, and academia. The transformation of these devices from the military and private sectors to the consumer market created new relationships between individuals and their devices. These devices eventually spawned acceptance within popular culture and became important symbols within most areas of culture. Movies, music, and other forms of artistic avenues utilized technology as a means to relish pseudo-reality. More importantly producers used the new technology to promote surreal, neurotic behavior. These changes would likely not have occurred without the economic developments impacting the semiconductor industry.

Because these technological tools are still utilized in the current contemporary age, Americans started a new epoch in the 1970's. Indeed, while many of the 1970's and 1980's technologies are now obsolete, their creation led the way for the further development of personal electronics. Researchers looking back on this era could even say that the opening of the consumer market for these devices led society to return to a nineteenth century deontological and material centered culture. Whether these devices represented a new era of post-twentieth century

industrial production or a reversal of the human and industrial mechanical relationship is a matter of opinion. Nevertheless, the history of the technology and society sub-discipline will mark the 1970's and 1980's decades as a significant and revolutionary era of human technological thought and development.

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