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Introduction

Until the late 1960s, U.S. industry enjoyed a preeminent position in technology and commanded a significant market share in the field for industrial and commercial products. During the decades that have followed, however, competitive strides by the Japanese have made stunning impacts on world and domestic markets alike. Superior Japanese performance has been a growing concern in a wide array of industrial and commercial fields, including home electronics, office automation, semiconductors, robotics, and biotechnology. Once a war-torn, poverty-stricken country, Japan has taken great leaps towards supplanting the positions of other industrialized nations, such as America, as an innovative leader and replacing Western products with its own technological feats.

The consumer electronics field is a vivid example of an area formerly dominated by American ingenuity and subsequently taken over by cleverly produced, high quality, low priced Japanese goods. The videocassette recorder (VCR), a popular electronics device found in two out of five American homes, was originally invented as a broadcasting tool by a California-based American firm named Ampex in 1956 (Television and Video Almanac, 1988, p. 433). The invention evolved over the next two decades into a product that could be used in the home; but Ampex in particular, and the American electronics industry in general, fell out of competition. Today, the superiority of the Japanese in the home VCR field is so overwhelming that no American manufacturer even bothers trying to make such a product; instead, all the major American electronics companies—RCA, Zenith, General Electric, and the rest—buy Japanese-made VCRs and add their nameplates to them (Verespej, 1986, p. 29). Today Japan is the foremost producer and exporter of VCRs with 90 percent of the world's production (Abegglen and Stalk, 1985).

Much speculation has been made about Japan's astounding success in segments of the U.S. home market. Such speculation includes the persistent myth that while Americans are
naturally inventive and creative, the Japanese are merely clever copiers and adapters of imported foreign technology. After all, it is claimed, the importation of advanced technological processes is one of the leading factors in Japan's economic growth since World War II (Shishido, 1985). Therefore, according to this view, the Japanese have succeeded by shamelessly borrowing technological innovations from the U.S. and other nations and transforming them into inexpensive household staples.

However, if there was ever a time to label the Japanese as mere imitators, that time has certainly passed. Not only have the Japanese established a solid record of creativity and innovation, but there is growing evidence that Americans may be losing some of their knack for developing products (Rudolph, 1988). Along with their appropriation of basic imported technologies, the Japanese have also shown a growing talent for improving and enhancing consumer goods by translating them into reasonably-priced, useful products. The Japanese also appear to intuitively understand the needs and desires of the consumer market.

The home VCR market provides an excellent case study of Japanese appropriation and improvement of American-invented goods. This innovation, discovered by an American firm which enjoyed years of patent protection that should have given it a dominant competitive advantage in the field, has been handed over to Japanese companies. The reason for Japan's successful appropriation of VCR technology is not to be found in clever imitation. Rather, the Japanese success can be attributed to such factors as superiority in the manufacture of solid state devices, foresight in the consumer field, and a broadminded approach to the VCR target markets. The intent of this paper, therefore, is to examine the marketing and technological development of the VCR in the U.S. and its appropriation and dramatic improvement by the Japanese. I will begin the analysis by tracing the initial development of the VCR and the technological difficulties that were encountered by firms determined to produce a successful prototype. I will then point out the factors that led the Japanese to dominate VCR production and the American firms to falter. Finally, I will discuss what implications these factors have with regard to the issue of Japanese creativity and technological ability.

The Emergence of the VCR Concept

On September 27, 1951, David Sarnoff, President of RCA Laboratories, celebrated the 45th anniversary of his start in the radio business. A gala ceremony was held in RCA Laboratories in Princeton, New Jersey. During the ceremony Mr. Sarnoff gave a speech concerning how to prepare for his 50th anniversary, just five years away.

Sarnoff, who was celebrated for his powers of prognostication as far back as 1916 when he envisioned the presence of "radio music boxes" in ordinary homes, suggested three presents that he would be pleased to receive at his 50th anniversary: a true amplifier of light, an all-electronic air conditioner, and a television picture recorder that would record the video signals of television on an inexpensive tape (Lardner, p. 55). The third request was one which was well-understood by the engineers at RCA. The firm was associated with broadcasting networks through its NBC subsidiary, and the only way to record a television program back in 1951—the days of live TV—was by kinescope recording, a process that amounted to putting a movie camera in front of the TV screen. Not only was this process costly, but it also produced a less-than-desirable picture quality and was a time-consuming process as well. Time was a factor of particular concern to the broadcast field back then since networks often faced the task of taking a live transmission of a program airing at one time in the East and preparing a recorded version for broadcast three hours later in the West. A video tape recorder would provide a quicker, cheaper alternative to TV broadcasters.

Although there exists no barrier in principle to recording a television signal, the task provides a great deal more complexity than recording an audio signal. A TV image is an intricate and complicated one that must be changed 30 times a second to simulate motion. Therefore a TV signal must transmit millions of
instructions to the picture tube every second. The main difficulty associated with recording a high definition signal lies in the frequency involved, which extends to six megahertz (six million cycles a minute), and the range of frequencies, which covers about 20 octaves.

The mechanics of recording and playback for audio involves the recording tape, recording head, microphone, and speaker. The recording tape used is generally made of a plastic base and contains a binder, or coating, that holds magnetic powder used to record a signal to the base. This tape is pulled past a recording head which produces fluctuations of intensity and polarity in direct response to the electrical input of a microphone, leaving a trail of magnetism on the tape. During playback the roles are reversed with the magnetized particles on the tape dictating to the head, which in turn relays fluctuations in magnetism to an amplifier and then to a speaker. Similarly, in television recording the electronic camera changes the variations in light, which compose a picture, into a long train of electrical impulses. The impulses representing dark and light parts of the picture act on videotape as the impulses representing changes in amplitude act on audiotape. Although this is a relatively straightforward process, the intricacies of the TV signal call for higher frequencies to transmit the signal.

The solution that first occurred to engineers working on a video recording process was to use a modified audiotape recorder and simply speed up the recording process. Just as a tape recorder is set at a higher speed for music than for speech, the recorder would have to be set at a still higher speed for TV. This idea set engineers at RCA to work in 1951 on increasing the speed of a basic modified audiotape recorder and resulted in a prototype in which the tape hurtled past the recording head at a speed of thirty feet per second (20 miles an hour)—so fast that the engineers charged with stopping and rewinding the machine had to wear heavy leather gloves (Lardner, p. 57). This prototype took over a mile of tape to hold a four-minute long recording and had a picture suffering from poor resolution, flicker, diagonal disturbance, and occasional ghosts.

### Invention of the VCR

As RCA engineers attempted to increase tape speed, engineers at Ampex Corporation in Redwood City, California, followed a different research route. Charles Ginsberg, who was in charge of Ampex’s videotape recorder project, had committed himself to an idea conceived by Marvin Camras. Camras had envisioned a machine in which the head, as well as the tape, was a moving part—and was in fact the faster moving of the two. Ray Dolby (later of “Dolby sound” fame) further developed the notion by implementing a system using four heads along with a two-way switching system that simplified circuitry and corrected timing sequencing. These heads were placed along the side of a rotating drum and made single lines of magnetism on the tape—a process called “transverse scanning.” Such a process economized on the use of tape and was capable of recording much higher frequencies than those achieved in the original recording machines. Since the problem with RCA’s prototype involved head-to-tape speed (the speed at which the tape passed the heads) and maintenance of a low reel-to-reel speed (to reduce the total length of tape required), Ampex’s idea of moving the tape heads was an ingenious one (Robinson, 1974).

In addition to the idea of using moving heads, Ampex was working on the concept of using FM (frequency modulation) as opposed to AM (amplitude modulation) recording, since AM is well-known for its sensitivity to interference. FM had never been used before in conjunction with magnetic tape because its signal took up a great deal of space. With a four-minute recording already requiring one mile of tape, engineers shied away from complicating the problem by adding FM recording. However, Charles Anderson, an Ampex engineer familiar with the field of FM broadcasting, reasoned that it was the rate of change in the frequency and not the frequency itself that conveyed picture information and argued that the use of FM recording would suffice.

In February of 1956 Ampex produced a prototype that showed a promising picture. With the aid of transverse scanning and FM
recording, the Ampex machine had the tape moving at the pace of 15 inches a second and had the capability to record a ninety-minute program on a fourteen-and-one-half inch reel as opposed to a four-minute program on a seventeen-inch reel in the RCA prototype.

Although Ampex gained a significant advantage as the first company to discover a viable recording process among the many firms competing to do so, Ampex had only the dimmest notion of what it had accomplished. In its potential demand forecast for the product, managers at Ampex concluded that an expectation of approximately 30 machines in four years would be reasonable. After all, as Joseph Roizen, an Ampex development engineer and product manager, reasoned, "It was just going to be used for time delay, and how many people needed to do that?" (Lardner, p. 59). Never did Ampex anticipate the phenomenal effect that video recording capabilities would have either on the broadcast market, ending the age of live TV, or on the consumer market, as a popular time-saving mechanism.

To say that Ampex's forecasts were conservative would be an understatement. Within four days after its product demonstration, Ampex had contracted to sell some 80 machines at fifty thousand dollars each.

The Japanese Takeover

Ampex's discovery in 1956 was a unique one; for it not only established the best method available at that time for recording a TV signal, but in developing this method used very clear-cut and well-defined technologies—namely, transverse scanning and FM recording. This allowed Ampex to secure strong, clearly-defined patents—a factor which led RCA and many other American firms to scrap their own efforts and designs and to try to effect an arrangement with Ampex instead. The lack of competitive threats by other American firms and the overwhelming thrill of discovery left Ampex with a false sense of security, and led the firm to believe that its discovery would mean the control of the VCR business at home and abroad for years to come.

However, as Ampex sat back and reaped the benefits of its discovery, Japanese firms such as Sony, Toshiba, Matsushita, and JVC continued to toy with the VCR technology, as they had been doing since 1953. The Japanese firms did not shy away from producing a VCR because of Ampex's patents; rather the very idea that Ampex had proved that television recording could be done attracted them to the market. The Japanese government industrial planning agency, MITI, played an important role in stimulating Japanese corporate interest in the VCR. When NHK and other Japanese broadcasters applied to the government for permission to buy Ampex VCRs at a cost of more than eighty thousand dollars each, the thought of so much money flowing overseas provoked MITI to make a pool of money available for a crash effort to produce a domestic alternative. MITI's answer was to prompt Japanese firms to develop a way to produce VCRs that would be independent of Ampex's patented technology.

As a result of their research, the Japanese companies developed a new technology in which the recording head produced a magnetic trail that ran diagonally across the tape. This new technology was developed in the research laboratories of Toshiba Massuda, one of Japan's largest electrical equipment and electronics firms, by Dr. Norikazu Sawazaki. The new process involved only one revolving head and was capable of continuously recording the whole TV picture field on a slant track (Sawazaki; 1960). The process made each "swipe" across the tape longer than in transverse scanning, which in turn reduced the number of times the signal had to switch from one head to the other head and allowed for simpler circuitry. Because the path of the tape resembled a helix, or coil, the technology became known as "helical scanning." Unfortunately, the systems developed in Japan still depended largely on the FM recording method patented by Ampex, and this provided an insurmountable barrier to any Japanese firm with hopes of an early entrance into the field.

Adopting New Technology

Japan's breakthrough into the field came when Ampex made the decision to transistorize its recorders to make them smaller and
less expensive. At the time (1960), Ampex engineers were accustomed to using vacuum tubes rather than solid state devices. Therefore, they were at a decided disadvantage due to their lack of expertise in this field. To compensate, Phil Gundy, vice president of marketing, solicited the help of a Japanese firm—Sony—whose transistorized devices had impressed him during his travels in Japan. Gundy proceeded to make a proposal to Sony that would involve Sony in the design and supply of transistorized circuits for use in a “portable” version of the Ampex VCR; in return, Sony would receive the right to make VCRs for non-broadcast customers. In 1960 a letter of agreement was signed, and Sony started on its path towards domination of the VCR consumer market.

The ready adaption of new technology by the Japanese soon gave them a strong advantage over American firms and opened the doors to production of the VCR—a product they helped make more affordable and portable through the use of transistors. Developing the transistor radio and, years before, the tape recorder had been formative experiences for Sony. Sony had had its start in a leaking, war-torn factory where its engineers worked with umbrellas over their desks to keep out rain and the other elements. Its first two products, a rice cooker and a heated cushion, had failed commercially and had led the company to the production of tape recorders. In 1948 no plastic (which was used as recording tape) could be found in war-torn Japan, and Sony first marketed a tape recorder using plain paper and magnetic powder as its tape.

With the later development of the transistor, Sony not only established a technological superiority in the field of solid state devices, but it also established a pattern which it would follow in later years: “the determination to do something other companies had not done; the struggle to improve the yield; and the maniacal embrace of a goal” (Lardner, p. 51). The Japanese learned to embrace rather than resist technology and visualized the adoption of new techniques and the eradication of old methods as a competitive weapon rather than a threat. Hard work and insight are important ingredients in turning sophisticated technology into simple consumer goods. This philosophy is one which is sometimes overlooked by many Americans who seem so often overwhelmed by the “impossibility” which they assign to tasks. Masaru Ibuka, founder of Sony, often tells the story of his visit to Western Electric to learn about transistor technology:

They asked me, “What do you intend to use transistors for?” When I answered, “I am considering using them for radios,” they kindly advised me, “Don’t waste your time and money” (Ibuka, 1975, p. 16).

It was also Sony which, when the large American companies decided against putting compact discs (CDs) in production because of the huge capital outlay required, was the first to go into CD production along with Philips of Holland.

American firms, like Ampex, had a more hesitant attitude towards the adoption of new technology—a factor that hurt Ampex in the final reckoning. It was not until 1960, four years after the first Ampex VCR demonstration—a long time in the ever-changing electronics field—that the vice president of marketing, Phil Gundy, realized that Ampex had better transistorize its recorders to make them cheaper and more reliable. However, Ampex’s deficiency in the area of solid state devices was a hindrance to the firm. Ampex product manager, Joseph Roizen, related during an interview:

We knew how to design circuits with vacuum tubes backwards. We didn’t understand solid state devices. Most of the guys were in their late ‘twenties or ‘thirties, and all of a sudden everything they learned in college was obsolete, and young guys were coming out of college with this transistor technology. So nobody at Ampex was very enthusiastic. In fact, there were some engineers with little signs on their desks that said, “Help stamp out transistors!” (Lardner, p. 63).

Resistance to the introduction of new technology is, in fact, a long tradition in the West, symbolized by the Luddite movement against textile machines in early nineteenth century Britain. Labor relations problems intensify this technological resistance, for in Western companies new technology is often viewed as a threat to employment and income
levels. On the other hand, the Japanese welcome new technology in terms of the potential it creates for increased profits and for the additional job security provided by the improved performance of the companies for which they work.

**Strategic Planning**

When engineers at Ampex and in Japan combined the technologies of helical scanning with transistorization in 1960, they paved a clear path for the development of the VCR for the mass market. It then became the duty of each firm involved in VCR development to establish a lucrative market and to develop a long-term commitment to cultivating its chosen markets. While engineers at RCA (who worked under cross-licenses with Ampex) and Ampex saw the potential for developing the technology, the top managers in both firms decided to focus their video efforts on the broadcast market—a decidedly limited field. The opportunity inherent in the new design synthesis was most clearly perceived by the Japanese firms—Sony, JVC, and Matsushita. It is these three companies that have dominated the home video market since 1957.

After the failure of RCA to be the first to develop a videotape recorder, it scrapped its VCR designs and worked under cross-licensing with Ampex. However, RCA's attention to the VCR field was sporadic; senior corporate executives were instead preoccupied with challenges by Zenith and other firms in the area of television receiver manufacture. At the same time, electronic computers were becoming a big industry and caught RCA by surprise. Consequently, RCA's management terminated work on applications of videorecording in 1958. It was not until the early 1970s that RCA again attempted, abortively, to innovate VCR design with its SelectaVision, a product which became a commercial failure (Cusumano and Rosenbloom, 1987, p. 55). RCA's decision to market videodiscs with SelectaVision not only turned out to be a $1 billion dollar mistake—including R&D costs, operating losses, and the eventual writeoff—but forfeited any chance for RCA to cash in on manufacturing profits from the VCR boom (Verespej, 1986, p. 32). As it turned out, RCA made several mistakes by underestimating its competitors. For example, it chose to develop videodisc technology rather than VCR technology because it believed that the machinery needed to mass produce pick-up heads on tape could not be improved. It also underestimated the ability of its competitors to cope with these manufacturing difficulties. The same problem was faced by the Japanese, but they solved it in the laboratories of Sony and Matsushita (*Business Week*, 1984, p. 89). Similarly, RCA did not think VCR prices could come down significantly because it underestimated the ability of Japanese firms to cut manufacturing costs. Finally, RCA did not anticipate that the market for rented movie tapes would be very large, driving down software costs for VCRs to levels far below costs of the videodisc.

At Ampex, after the first successful VTR (videotape recorder) design was developed, a transistorized VCR was marketed for closed-circuit use in 1962. Ampex ignored the competitive efforts of Japanese firms in the field since Ampex then accounted for 80 percent of all television recorders in use throughout the world and felt well-positioned to extend its dominant share into the consumer market (*Business Week*, 1967, p. 167). Ampex felt no threat in 1962 when Sony demonstrated the first fully-transistorized VCR with a two-head helical scan system, for it thought the Sony design would never succeed commercially (Lyons, 1976, p. 203). However, Sony's design was successful. Later, when Sony Corporation Vice President Shigemi Nakaro claimed in 1970 that Sony would soon be marketing a video system at $350 per player, a price much lower than that of Ampex's model, managers of American companies (including Ampex) charged Sony with making idle claims (*Forbes*, 1970, p. 13). So rather than responding to foreign threats, Ampex made an effort to reduce dependence on VTR revenues, and top priority was given to assuring continued dominance in the studio equipment market rather than the video broadcasting field.

Leadership provided by general managers is essential to a corporation's achieving consistent direction over a lengthy period of development. In America, top management direction
has all too often been lacking or inconsistent over time. Clarity of the commitment by Japanese firms to pursue the potential consumer market, however, shaped critical choices among uncertain technical alternatives. Because of this commitment the Japanese did not pursue random “breakthrough” technology as did some of their American counterparts. Sony, in particular, rapidly became the leader in the development of VCR technology for the mass market, for Sony had always thought of the VCR as a potential consumer product. It was not only a simple time-saving device for people “on the go” but represented “defiance against [programming] tyranny.” In other words, Sony thought that the customer should be able to watch what he’d like to, when he’d like to. Sony’s efforts in the manufacture of the VCR were consistent with its strategic planning: to attract the consumer market the VCR had to be made as reliable as possible, compact in size, and less expensive. Thus, in contrast to the on-again, off-again efforts in VCR development by the Americans, the Japanese’s progress was steady and incremental.

**Marketing The VCR**

As Sony strived to seek the “ultimate” machine for the consumer market, technological improvements continued. Iron oxide gave way to a finer, more sensitive magnetic powder on the tape. Micromanufacturing processes allowed for a smaller recording head. A new tape loading system called U-loading also was developed.

In 1969, all these advances helped produce the Sony U-matic, which was the first videocassette recorder to reach the mass market. However, before the U-matic was formally introduced, Sony took an unprecedented step. Sony realized that success depended largely on familiarizing the consumer with the VCR and emphasizing its easy use so as not to “intimidate” those who were technologically unsophisticated. But at this time, other Japanese companies were also working hard at different VCR models. Sony feared that if all companies were to come up with incompatible formats, the consumer would recoil in confusion. Therefore, it decided to show its machine to two of its Japanese competitors—Matsushita and JVC—in the hope that they would adopt it as a common standard for the market. Both competitors studied the machine, made recommendations for improvement or change, and eventually agreed to adopt the format. The Oriental wisdom involved in consolidating the marketplace by standardizing the equipment to make it interchangeable meant that the in-fighting among manufacturers would not result in confusion about what they were selling. This is a lesson which American manufacturers have yet to learn: winner-take-all fights have left the consumer with much outdated equipment over the years. On the other hand, the Japanese have learned that aggressive coexistence can make everybody better off (Robinson, 1974, p. 259). Collaborative efforts among the Japanese have resulted in many other technological improvements, including the development of azimuth recording, color advances in tape making, integrated circuits, and servo-mechanisms. Sony’s next generation of video machines was the product of long, collaborative efforts guided by patience until each specification was met.

Efforts by Matsushita and JVC to cultivate the consumer field have also been substantial. Matsushita, known for its lines under such names as Panasonic, Quasar, and Technics, has a company strategy of making product innovations cheaper and more affordable for the home market. JVC made its impact on the market by producing the VHS, or video home system, in response to the consumer’s need for a longer recording time on the tape than the one hour provided by Sony’s Betamax. Consumer response to the longer playing time was extremely favorable. Within a few years after the VHS introduction, it had become the standard for over 80 percent of all VCR installations worldwide, outselling Betamax by three to one (Much, 1984, p. 51).

Ampex, in the meantime, had concentrated its efforts solely on the broadcast field—a strategy which led to problems. As a professional company used to dealing with highly knowledgeable buyers, Ampex was unaccustomed to marketing a product to a technologically unsophisticated consumer base. When
Ampex tried to target the education market, it found a market unfamiliar with the new videotape technology. In addition, in the business-to-business sales market, product specifications are often tailored to an account's specific needs. As a result, in the professional broadcast field, Ampex had often dealt with customers who were not afraid to voice their ideas on what features should be changed or added to existing systems they were buying. Consequently, the addition of extra features and modifications was making Ampex's VCR price rise, rather than fall, the longer it was on the market—which put it at a competitive disadvantage. Furthermore, although Ampex's machines had the extra features, their quality suffered from poor manufacturing. For example, Ampex's VCRs were heavier than the Japanese models and their tape guide system was erratic, so that programs recorded on one machine couldn't necessarily be played back on another. What is more, the Ampex machines developed a reputation for breaking down often (Lardner, p. 70). In the end, although the Sony VCRs didn't have all the "bells and whistles" offered on the Ampex machines, consumers felt the Sony machines were more reliable and convenient.

Learning By Trying

Whereas many American firms tend to respond to demand forces through a strategy based on forecasts and demand analysis, Japanese firms set out a clear strategy of creating demand. This practice stems partially from a Japanese mistrust of market research. Before the Sony Walkman emerged on the scene, market research had shown that consumers would not be interested in buying a tape cassette player that could not record (Johansson and Nonaka, 1987, p. 16). The stunning success of the Walkman has since shown this research to be mistaken. As Akio Morita, one of Sony's founders, proclaimed in a 1980 interview, "You can't research a market for a product that doesn't exist" (Cusumano and Rosenbloom, 1987, p. 56). This mistrust of market research has led Japanese firms to apply "high technology" to the consumer market by developing innovative products based on ambitious but specific markets and the conviction as to what will sell, rather than what existing markets already demand. As a result, Japanese firms are less likely to suffer from "marketing myopia" or to become late market entries, because the focus of their efforts is on creating demand, rather than responding to it.

The Japanese also have a system of "learning by trying." Whereas American firms worry about marketing the "perfect" product and focus too much on product features rather than product reliability, Japanese firms focus on quality manufacturing and add features suggested by market feedback. The Japanese firms flooded the market with a series of VCRs, learning from each error or success. At Sony the first machine developed was the SV-100, which turned out to be too large and costly for its customers. Next, Sony developed a series of smaller and less expensive models: first, the PV-100, a transistorized, helical scanning machine; next the EV (educational video) series that used one-inch-wide rather than two-inch-wide tape; and finally in 1965 the CV-2000, celebrated as the world's first "home videocorder."

Conclusion

Professor Harvey Brooks of Harvard University has offered an interesting perspective on Japanese creativity:

Although Japanese success in recent years has been based on adaptation of Western, mainly American, technology, and on the capacity to commercialize it more rapidly than its competitors, it would be wrong to conclude from this that the Japanese are mere imitators who, once they have attained to the world state-of-the-art in a field, will not continue to move forward the frontiers of technology. On the contrary, successful imitation, far from being symptomatic of lack of originality as used to be thought, is the first step of learning to be creative. It may be only those who try continually to reinvent the wheel that will lose out in the innovative race (Brooks, 1983, p.17).

In other words, the process of creation tends to include a large element of "copying." The automobile was not called a horseless carriage for
nothing. The automobile incorporates some basic principles of the horseless carriage; yet no one would classify or denigrate the inventors of the automobile as "copiers." In the same manner the current VCR has as much in common with the VCR created in the '50s as a 747 jet has with Wilbur and Orville Wright's airplane. Both share a common purpose, entertainment or transportation, but both are foreign to their ancestors in terms of appearance and technological sophistication.

The time to berate the Japanese as mere copiers may have existed in the past. But any current speculation that the Japanese will be unable to hold on to their competitive edge in the field of manufacture is misguided and unfounded. The day of determining which country holds the decided superiority in the manufacture of consumer goods looms on the horizon. New innovations such as ACTV (an interactive television system), high resolution television, freeze frame options, and digital transmission are just a few of the new concepts currently being refined and developed. One thing remains clear. The Japanese have managed to do quite well for themselves in closing the supposed "creativity gap," and the United States will no longer be able to take refuge in its claim of creative superiority. In the decades to come, the United States will have to muster every ounce of its entrepreneurial spirit, risk-taking ability, and technological know-how in order to remain competitive—because the Japanese are just getting started.

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