Songs of Comfort and Joy

David Alan Grier
George Washington University

The music industry's story is a vivid reminder that entire industries can fail to see shifts in the market.

Christmas in Texas is not white but brown, as the bleached dead grass languishes in the low-hanging sun of December. The summer is past, the harvest is over, and the time of reckoning is at hand.

AN UNCERTAIN STARTUP

The staff of Univac's North Dallas office did not quite know how to mark the holiday season in December 1958. They were new to the region, refugees from northern cities such as St. Paul, Minnesota; West Conshohocken, Pennsylvania; Long Island City, New York; and Evanston, Illinois. They had come to Texas to stake their fortunes on the new computer industry. It was a new land for them, a place with strange food and customs, far from family and friends.

The office, which was located at Southern Methodist University, was an experiment by Univac's parent company, Sperry Rand. The company had created this facility to sell scientific computing services to the oil industry, services that that industry was not sure it needed.

The office's primary product was a refinery management service based on a technology called linear programming. Univac claimed that this product would help oil executives maximize their refining operations' profits. The oil company would provide a few key pieces of data, such as the stock of oil on hand and its refining capacity, and the linear programming software would create a production plan based on market prices. To generate the greatest possible income, this plan would state how much gasoline, kerosene, or light lubricant the refinery should produce.

The office had been operating for two years and had yet to show a profit. A few of the smaller refineries had tried the service and been generally pleased with the results. However, the large firms stayed away.

The center's machine, a Univac 1103, which stood gleaming in a glass-encased computer room, was earning little revenue for the company. A few staff members had spent the summer at the company's Philadelphia headquarters office learning about new services they might offer to the Dallas business community. Having learned about databases, general ledgers, and accounts receivable, they had returned to Dallas with a burst of energy but no real direction.

Days with no customers stretched into weeks. Enthusiasm slid into frustration, which, in its turn, dropped into cynicism, and then collapsed into boredom.

A REMEDY FOR RESTLESSNESS

The remedy for their restlessness was the Univac itself. When a customer was not using the computer, the technical staff was free to use the machine to explore new ideas. They practiced their coding skills, experimented with new ways of sorting data, and tested different aspects of the device.

Perhaps the machine's most intriguing feature was its audio output circuit. "Each computer console had a small amplifier and loudspeaker connected into a data path within the computer," explained a Univac engineer. This hardware had been added to the computer as a troubleshooting device. "When certain test programs were run to check the operation of the computer circuits, the loudspeaker would put out a distinctive series of tones."

The Dallas programmers were not the first to be attracted to the audio circuitry. An engineer at Univac's Philadelphia office had created a program that would produce musical tones on the standard western scale. Dubbed the "Melody Maker" by its creator, this program had played a passable version of the *Beer Barrel Polka* for a Univac publicity event. Having read about this program, the Dallas programmers decided that they would create their own musical software, a program that would play Christmas music.

John Kamena, a tall, quiet man who had been trained in mathematics, led the programming effort. Although he enjoyed Big Band tunes, the cha-cha, and the occasional boogie-woogie piano tune, Kamena didn't know much about music. However, he loved to program and knew how to break complicated tasks into simple steps.

After a day or two of experimentation, Kamena created a little program that would generate sound at the pitch of middle C. It was "a beautiful rhythmic tone," wrote one observer, "not unlike an oboe."

Moving methodically through the problem, Kamena created a program that could produce all 12 notes in the

IEEE Annals of the History of Computing

The *IEEE Annals of the History of Computing* is the Computer Society's historical magazine. Published quarterly, *Annals* presents stories about the innovation and development of the computer. The current issue contains articles about the growth of the business that provided software to the personal computer.

western musical scale and developed a simple scheme that would represent melodies with a series of numbers. His colleagues helped by translating piano music into code. First came *Jingle Bells*; then *O Come, All Ye Faithful*; and finally, *O Holy Night*. The music coming from the machine "sounds like and is Christmas carols," wrote a slightly astonished reporter for the *Dallas Times Herald*.

The reporter arrived on 23 December and was immediately smitten by what he saw. "Univac Scientific is the hit of the season at SMU," he wrote. "It plays Christmas carols."

Kamena was both pleased and frustrated with the publicity. He was grateful for the acknowledgment of the office's technical prowess, but he also wanted to see success in its primary mission: providing scientific computing services. "Do you think you could, sort of, write something, too, about how Univac is generally used in education?" he pleaded.

Kamena had great faith in digital technology. He knew that each year, computers were getting smaller and less expensive, though perhaps he did not quite see the day when a machine far more powerful than his electronic oboe, the 2-1/2-ton Univac, would be no bigger than a deck of cards. Yet he, like so many others of his day, saw the future of the computer in solving serious problems—scientific work and business data processing.

Entertainment computing was too frivolous, too risky. Building a machine that would entertain people would require not only solving the technical problems but also adapting that technology to a business that tried to follow changes in public taste while minimizing commercial risk.

NEW TECHNOLOGIES AND THE MUSIC BUISNESS

In 1958, the newest music technologies were two different formats of phonograph records. Both had been introduced a decade before as possible replacement to the old shellac 78-rpm records. Most audiophiles felt that the most promising technology was the 12-inch long-playing (LP) record that Columbia Records had introduced in 1948. This disk could hold almost an hour of music, eight to 10 times the capacity of the 78s. By 1958, the LP had become the preferred format of the New York record companies. The three best-selling LPs in December of that year were all soundtracks of New York musicals: *South Pacific, The Music Man,* and *Gigi*.

The competing technology was, of course, RCA's 7-inch 45-rpm record, which had been patented in 1949. The 45 had roughly the same capacity as the 78—three minutes of music per side. Because 7-inch records were cheaper to produce than the 12-inch LPs, the 45 had been adopted by the small regional record companies: Sun Records of Memphis; Chess of Chicago; and Motown of Detroit, a company that would release its first records in January of the new year. The 45 captured the 1958 rock 'n' roll classics—Jerry Lee Lewis's *Great Balls of Fire* and Chuck Berry's *Johnny B. Goode*—as well as the musical curiosities of the time—Bobby Darin's *Splish Splash* and David Seville's *Chipmunk Song*.

In 1958, the music business could be divided into three major sectors: production, marketing, and retailing. Music production was in the record companies' hands. The US had three major record companies in New York (Columbia, Decca, and Victor), one in Los Angeles (Capitol), and a growing number of small regional companies like Sun and Chess. The retailing sector was in the hands of local merchants: department stores, appliance stores, and a new class of retail outlet, the record store. Music marketing was controlled by radio stations, which had evolved into several different formats, each promoting a different kind of music including classical, adult, country, R&B, and the new top 40.

Looking at the evolution of music technology, without considering the business that created and sold recorded music, reveals an orderly progression toward higher fidelity, greater capacity, and more control over the music. Following 1958, we see transistorized amplifiers, cassette tape recorders (1963), digital audio tape (1976), personal tape players (1979), and the compact disk digital system (1982). Even the 8-track cassette tape (1966) falls neatly into this history, for it allowed people to take recorded music with them in their cars.

While the recorded music business was adopting these technologies, it was also developing strategies to stay abreast of public opinion while doing the things that good businesses must do: expand markets, limit production expenses, and reduce distribution and inventory costs.

CHANGING OPPORTUNITIES

The 1970s and 1980s saw a steady conglomeration in all three sectors of the music business. Music labels were combined into gigantic firms. National networks purchased radio stations. Large chain stores supplanted family-owned record stores.

By the early 1990s, there was little room in the music business for local retailers. These smaller businesses simply could not accumulate the capital to compete with the large companies. The child of the 1990s who expressed a desire to own a record store or perhaps a radio station was gently guided toward a more plausible career, such as ballet dancer, firefighter, or astronaut.

We should not be surprised that, in 1958, a small group of computer programmers could not see how they might transform their $2 million computer into a viable music business. Such an idea was beyond their vision. However, we should be surprised that the music industry of 1992 failed to capitalize on the digital distribution of music, for this technology eventually would reduce three major classes of business expense: warehousing, shipping, and collecting consumer information.

The opportunity that major music industry players missed is even more surprising when we recall that modern digital music technology was created in full public view. The Moving Picture Experts Group, a committee of the International Organization for Standardization, developed the now ubiquitous MP3 file format between 1987 and 1991. The Internet, then promoted as "the information superhighway," was well established in the public consciousness by 1992. The music industry even promoted the digital distribution of a 1994 Rolling Stones concert from the Dallas Cotton Bowl.

There are, of course, many reasons why businesses fail to capitalize on business opportunities. Sometimes they fail to appreciate a new opportunity. Sometimes they are trying to protect existing capital investment and revenue streams. Sometimes they are faced with a conceptual problem they cannot solve.

All three possibilities seem to have played a role in the music industry during the 1990s. The early attempts to distribute music on the Internet—those that began between 1992 and 1995—were generally limited to small groups of individuals. At the same time, the major record labels were making a substantial profit from their investment in compact disk technologies. Finally, none of the companies had a workable proposal for protecting their products and limiting the unauthorized distribution of recorded music.

When the record companies did not embrace the digital distribution of music over the network, others took

their place. By 1998, so many people were illicitly sharing music that compact disk sales fell. A year later, Napster institutionalized this music-sharing practice. By the time the record companies and recording artists reacted to these changes, they were too late. Large parts of their popular music catalog were in free circulation on the Internet, a circulation that materially damaged its value.

After a slow start, the major music industry players have moved forcefully to protect their assets. They have shut down Napster and its variants, moved to limit open music sharing among a prime market segment—American college students—and created their own network outlets. Even as they attempted to defend their position, they saw the old institutions of their business crumble away. Record retailers filed for bankruptcy. Radio stations lost listeners. A generation turned away from the CD.

In that distant December of 1958, the small staff of the Dallas Univac office was torn between the hope they cherished for their young industry and the concerns they felt about the business prospects of the market for scientific computing.

The office had a few regular customers, including an elderly oil baron who came to the building once a week with his data in a brown leather folder and waited patiently while the computer completed his production plan. However, such business was not

enough to keep the office open. A few of the staff were quietly looking at other job possibilities. John Kamena was thinking about taking a data processing position in San Francisco.

On 24 December, they ended the day with a party that gathered around a small tree in the machine room. The *Dallas Times Herald* article was passed from hand to hand as the Univac played its full repertoire of carols. As they listed to the machine playing its tinny version of a song, they would add their voices to the chorus.

In that dark night, they sang songs to comfort their hearts. They sang for themselves and for their business; they sang for the women that had followed them south and for their babies tucked quietly in bed. They sang, unsure of their future and unaware that one day the best-selling computer would do nothing but play music and that scientific computing would become a tiny part of the computer industry. They sang with pride in their own creation and with an anxious hope for a better year. They sang the songs of comfort and joy that night. They sang songs of comfort and joy. ■

David Alan Grier is the editor in chief, IEEE Annals of the History of Computing, *and the author of* When Computers Were Human *(Princeton University Press, 2005). Grier is an associate professor in the Center for International Science and Technology Policy at the George Washington University. Contact him at grier@gwu.edu.*