

Immigrant Entrepreneurs In The High-Tech Industry

by Melanie Erasmus*

Immigrant entrepreneurship has been an important part of the history of immigrants in the United States. For many, the topic conjures up images of small neighborhood grocery stores, and the like. Certainly many of today's immigrants have continued the tradition of engaging in these types of modest enterprises, but many immigrant entrepreneurs of recent vintage have developed businesses that are anything but small. This paper provides a sampling of companies in one area — the high-tech industry — in which immigrants have played key roles in developing.

Political Backdrop

Heated political debate has surrounded several bills moving through the Republican-dominated Congress that seek to clamp down on both undocumented and documented immigration.¹ Among the provisions being considered are: reducing the total number of legal immigrants from 800,000 to 535,000 per year; making political asylum more difficult to obtain; placing an annual ceiling of 50,000 on refugees; increasing financial requirements for a United States citizen to sponsor an immigrant; requiring employers to verify the legal status of job applicants through a new registry of social security and alien registration numbers; eliminating immigrant categories for siblings of U.S. citizens and adult children of lawful resident aliens; and making it more difficult for United States firms to recruit foreign workers.²

Senator Alan Simpson's bill is typical of these bills and focuses on limiting both family reunification categories and employment visas.³ In addition to seeking to charge businesses a fee for hiring and bringing in highly-skilled foreign workers, the bill would reduce immigrant visas currently reserved mostly for skilled workers from 140,000 to 90,000.⁴ This is despite the fact that the number was just raised to the 140,000 level in 1990, because of a two-year backlog of foreign workers that American companies

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wanted to hire. To Simpson, the issue at stake is jobs; he asserts that immigrants, many of whom may be engineers and computer programmers in high-technology industries, are taking job opportunities away from native workers.⁵ While he believes the United States needs to admit foreign skilled workers to keep American business at the forefront, this goal must be balanced with protecting American workers.⁶

The High-Tech Industry

The world-dominant computer industry in the United States depends on a workforce that is disproportionately composed of immigrants. An estimated 15,000 Asian immigrants are employed in Silicon Valley, about a quarter of the total workforce.⁷ Some 20 percent of Intel Corporation's engineers are Chinese immigrants; and at Cadence Design Systems, a software company, foreign-born Chinese American engineers may represent as many as 80 percent of the technical staff.⁸ At AT&T Bell Labs in New Jersey, 40 percent of researchers in the communications sciences department were born outside the United States. Similarly, a quarter of the researchers at IBM's Yorktown Heights facility in New York, are of Asian descent.⁹ As one computer industry analyst put it, "The United States would not be remotely dominant in high-technology industries without immigrants. We are now utterly dominant in all key information technology domains. And at every important high-tech company in America, the crucial players, half of them or more, are immigrants."¹⁰ Intel's Chief Executive Officer Andy Grove, who immigrated from Hungary in the 1950s, called his ranks of immigrant engineers "our secret weapon."¹¹

According to industry officials, one reason for their reliance on foreign nationals is that the United States is not producing enough skilled workers in certain job categories to be globally competitive.¹² Leading software company Microsoft, for example, was unable to fill a quarter of its openings in technical positions in 1994 because of a scarcity of qualified candidates. According to Microsoft, the U.S. labor pool does not have enough graduates in technical fields to meet the demand.¹³ The founder of RayDream, another software company, asserts that the company's goal of hiring native-born software engineers has not been very successful because too few applicants have the desired mathematical backgrounds.¹⁴

Foreign nationals in 1974 accounted for 33 percent of engineering master's degrees and 52 percent of engineering Ph.D.s in the United States. This makes them highly desirable in the high-technology and scientific

fields, and a significant portion remains in the United States as employees in the high-tech industry. Indeed, close to 50 percent of the foreign born entrepreneurs surveyed in this project completed their studies in the United States.¹⁵

The industry also serves as a magnet for talented engineers and scientists from abroad. The concentration of computer, biotechnology, and other electronics companies in certain geographic areas of the United States draws foreign entrepreneurs to those areas. Founders of RayDream, ParaGraph, Genelabs Technologies, and Solectron, for example, all assert that they chose to locate their companies in Silicon Valley in order to be close to customers and suppliers.¹⁶

The high-tech industry reaps an enormous benefit from its multicultural workforce. Stephen Pachikov, the Russian-born founder of the software company ParaGraph, believes that diversity in education and culture of foreign workers contributes to the development of cutting edge technology.¹⁷ Further, many immigrant entrepreneurs in the high-tech industry have connections throughout the world, enabling them to sell their products and services internationally. Eric Hautemont, the French founder of RayDream, is convinced that the mix of European and American cultures in his company has helped them do business abroad.¹⁸

In a field where an industry goal is to operate in the worldwide arena, the multicultural workforce seems to be a must. As one scholar put it, "This allows U.S. companies to relate more effectively with international markets [and] builds connections between the U.S. and international markets."¹⁹ For example, Genelabs Technologies, a biotechnology company, was able to form a joint venture with Taiwan and received investment from the Taiwanese government because of its Chinese co-founder.

Little wonder that the high-technology industry is strongly opposed to proposals that would reduce the category for skilled immigrant workers. Its leaders argue that these changes would cripple their ability to recruit worldwide for highly specialized jobs and that the industry would therefore suffer. They maintain that immigrants not only fill critical engineering and scientific positions, but, as entrepreneurs, they also create jobs and push the boundaries of technology. Put differently, entrepreneur Daniel Kwoh, co-founder of VCR products company Gemstar, does not believe that legal immigration should be more restrictive because the United States is "reaping the benefits of brain drain from other countries."²⁰

Immigrant Entrepreneurs And Their Companies

Computer Associates International Inc.

Computer Associates International Inc., located in Islandia, New York, was co-founded in 1976 by Charles B. Wang,²¹ who is the company's chairman and chief executive officer. The enterprise started with no venture capital and only one product and is now the second largest software company in the world (after Microsoft). Computer Associates is the world's leading independent software company for multi-platform, business software computing; its software products have been installed in almost every Fortune 500 company.²²

Computer Associates employs 9,000 people worldwide, with approximately 6,000 employees based in the United States. Its revenues for fiscal 1995 exceeded \$2.6 billion, representing a 22 percent increase over 1994. The success of this Fortune 500 company is attributed to Wang who has a deep knowledge of computer technology and the challenges facing senior corporate management.²³

In 1949, Wang fled mainland China at the time of the Communist Revolution and came to the United States with his family. He was eight years old and spoke no English. He subsequently majored in physics and mathematics at Queens College in New York before deciding that he would become a computer programmer. Wang learned programming at the Electronic Research Laboratory at Columbia University. When he founded Computer Associates, he was 32 years old and completely without resources. Today his software business is worth nearly \$11 billion.²⁴

Solectron Corporation

Solectron was co-founded by Winston Chen and Roy Kusumoto in 1977, in Milpitas, California. What began as a small assembly shop with annual revenues of several thousand dollars is now a company whose 1995 sales revenues were \$2.06 billion. Solectron has enjoyed a growth rate of 60 percent per year since 1978, and employs 10,000 people worldwide, with 5,500 employees in the United States.²⁵

The company operates one of the world's largest facilities for the assembly of complex printed circuit boards and subsystems for makers of computers and other electronics products. Solectron has won two prestigious awards: the Malcolm Baldrige National Quality Award in 1991 and the (California) Governor's Golden State Quality Award in 1994.²⁶

Chen emigrated from Taiwan in 1965, and came to the United States where he obtained his M.S. and Ph.D. in applied mechanics from Harvard University. After working for IBM for eight years, he started Solectron with \$300,000 and served as chairman and chief executive officer from 1978 to 1994. He now chairs the Paramitas Foundation and serves on the board of directors of several high technology companies. He was chosen Bay Area Entrepreneur of the Year in 1990, and was selected as a member of the business delegation for President Bush's Asia/Pacific visit in 1992. Chen is a member of the board of trustees of Santa Clara University and the Engineering Advisory Committee of the National Science Foundation.²⁷

Intel Corporation

Intel, with its headquarters in Santa Clara, California, is the world's largest maker of computer chips. The company produced the world's first microprocessor and sparked a computer revolution that has changed the world. About 75 percent of the personal computers in use around the world today are based on Intel-architecture microprocessors. It employs 32,600 people worldwide, with approximately 23,000 based in the United States, and its revenues for 1994 exceeded \$11.5 billion.²⁸

Andrew Grove, president and chief executive officer of Intel, is a Hungarian immigrant who fled Soviet tanks and came to the United States in 1956. Although he could not speak a word of English when he entered, Grove graduated at the top of his engineering class at City College three years later.²⁹ Grove went on to earn his doctorate in chemical engineering from the University of California, Berkeley. After five years at Fairchild Semiconductor in California, he left to help form Intel. He was 31 years old.³⁰ Intel was founded in 1968 by Gordon Moore and Robert Noyce along with six others from Fairchild. Grove received the 1995 Heinz Award for his contribution to technology and the economy.³¹

Intel introduced the state-of-the-art Pentium microprocessor in 1994. The project was managed by Vinod Dham of India, and one of the chip's two principal architects is another Asian Indian American, Avtar Saini.³²

LSI Logic

LSI Logic was founded in 1981 by Wilfred Corrigan in Milpitas, California. LSI Logic is the market share and technology leader in the custom, high-performance application-specific integrated circuits (ASICs) market. Its sales revenue for 1994 was \$902 million and exceeded \$1 billion in 1995.³³ The company has 3,700 employees, 2,400 of whom are employed in the United States. Currently the company is investing \$4 billion in a new

campus in Gresham, Oregon that is expected to employ nearly 500 employees. Interestingly, a company spokesperson has warned that “the rate at which the development group can grow will be limited by the small number of engineers qualified to work in this specialized field.”³⁴

Corrigan immigrated from England in 1960, after receiving a chemical engineering degree from London’s Imperial College of Science and after deciding that his future lay in the United States.³⁵ Prior to starting LSI Logic, he worked for Motorola Semiconductor and then went onto Fairchild. He eventually became chairperson of Fairchild Camera and Instrument Corporation in Mountain View, California. Today he is chair and chief executive officer of LSI Logic.

Wang Laboratories

Wang Laboratories, based in Lowell, Massachusetts, was founded in 1951 by An Wang,³⁶ who invented magnetic computer memory. The company now produces workflow, integrated imaging, document management, and related office software for client/server systems.³⁷ Much of its designs are based on the perceived potential in software services that may reduce paperwork.³⁸

The company was a major player in the high-tech industry but began slipping in the mid-1980s. The company’s downfall came when the industry shifted away from the minicomputer and proprietary systems that Wang offered and moved toward smaller personal computers or open systems that accommodate varied vendor technologies. By the late 1980s, Wang began reporting heavy losses.³⁹ After a bankruptcy reorganization, however, the company emerged as a slimmer, more focused imaging software company. The company reported revenue for 1995 of \$946.3 million, and employs 6,800 people worldwide. Further, software leader Microsoft recently invested \$90 million in Wang.⁴⁰

Wang, a Chinese immigrant, came to the United States in 1945. He was admitted to Harvard and in less than four years made a fundamental discovery about core memories. His work became the cornerstone of the computer industry’s development for almost two decades. In 1988, Wang was inducted into the National Inventors Hall of Fame, where he joined an elite group of 68 past inventors with names like Edison, Marconi, Bell and the Wright brothers. Wang has 40 patents.⁴¹

AST Research Inc.

Three immigrants co-founded AST Research in 1980: Safi Qureshey, Albert Wong, and Tom Yuen. Located in Irvine, California, AST has grown from a tiny start-up into the seventh-largest personal computer manufacturer in the United States, with \$2.5 billion in worldwide revenue. The company designs, manufactures, and markets IBM-compatible personal computers, including desktop, notebook, and network server systems. The company has been one of the premier systems manufacturers and consistently controls a 2.7 percent market share.⁴² The company has 6,500 employees worldwide, with 2,500 in the United States. Although AST reported losses of \$99.3 million in 1995, the company has restructured its domestic operations, changed management, and received a large infusion of cash from Samsung.⁴³

Qureshey, originally from Pakistan, is chair of the AST board. His co-founders, Wong and Yuen, are both immigrants from Hong Kong. The three began business in Yuen's garage with \$12,000 in cash and \$28,000 in equipment. Qureshey came to the United States in 1971 in order to obtain a degree in engineering and chose to remain in the United States because "there was hardly anything going on in electronics (in Pakistan). So the skills that I had I could not really apply in my homeland.... California was really the state that was producing the components, the new companies, the excitement." Although he first worked as an engineer, he decided to "go out on his own" because he could not get marketing or sales experience working for others as an engineer.⁴⁴

Lam Research

Based in Fremont, California, Lam Research was founded by David Lam in 1983. The company manufactures semiconductor processing equipment. In 1995, the company had revenues of \$600.7 million. It employs over 3,000 employees worldwide, 2,650 of whom work in the United States. The company intends to actively increase jobs in order to keep up with the demand for their equipment from chip factories all over the world.⁴⁵

Lam was born in China but fled with his family during World War II to Cholum, Vietnam. After finishing high school in Hong Kong,⁴⁶ Lam decided to complete his education in the West where he believed there were more opportunities. He completed his undergraduate studies in Canada before receiving his Ph.D. at MIT in chemical engineering. His thesis on plasma engineering later became the foundation of his work with Lam Research. He worked for Texas Instruments, Xerox, and Hewlett Packard before founding his own company.

Lam started his own business because he perceived a glass ceiling for immigrants in the high-tech industry. He felt that Asians were underrepresented in the management ranks and believed that programmers and engineers should take the initiative to develop basic managerial and interpersonal skills, which are not generally taught at engineering school.⁴⁷

In addition to Lam Research, in 1988, Lam also co-founded software company Expert Edge, with Stanford University professor Erlison Tse.⁴⁸ Lam serves as president and chief executive officer of the Palo Alto company. Expert Edge employs 22 employees and writes software that controls manufacturing equipment for chipmakers and automakers.

Lam was appointed to President Bush's Presidential Commission on Minority Business Development in 1990.⁴⁹

Borland International Inc.

Borland International, located in Scotts Valley, California, was founded in 1982 by Phillippe Kahn. The company has 900 employees worldwide, 700 of whom are located in the United States, and 1995 revenues were \$254 million. In the late 1980s, Borland was the number three maker of personal computer software, boasting top-selling spreadsheet and database products, such as Quattro Pro and Paradox. Borland was one of the first companies to incorporate object-oriented technology in its products, and today the benefits of object-oriented technology are recognized throughout the industry. Since that time, however, Borland has suffered financial losses culminating in Kahn's resignation as board chair. The company's strategy to continue as a smaller operation and reposition itself as a maker of software development tools has made the company profitable again.⁵⁰

Kahn was born in France and led Borland for 12 years as president and chief executive officer. A mathematician and self-taught programmer, he founded Borland by selling an inexpensive version of the Pascal computer language through the mail. At the time that he started Borland, he was an undocumented immigrant. Kahn also co-founded the software company Starfish, in 1994, based in Scotts Valley. Starfish, founded without venture capital, posted \$8.5 million in sales in its first nine months and has 60 employees⁵¹ working on producing a variety of internet and on-line products.

Komag Inc.

Komag is the world's largest supplier of thin-film media for computer hard disk drives. Based in Milpitas, California, Komag was co-founded by

Tu Chen. The company's sales revenue for 1994 was \$392.4 million and posted record financial results for its 1995 third fiscal quarter. Komag employs 2,700 people worldwide, 1,803 of whom work in the United States.⁵²

Chen was born in Taiwan. He has a Master's and Doctorate degree in metallurgical engineering from the University of Minnesota. Chen, two other Taiwan-born friends from IBM, and Stephen Johnson founded Komag with the assistance of venture capital. Chen had led the Xerox company's research efforts to adapt the thin-film technology used in the production of semiconductors to the production of magnetic disks for storing and retrieving data in computers. Komag's goal was to bring Chen's ideas into production after Xerox abandoned its thin-film technology efforts. Today, thin-film sputtering, the technology approach pioneered by Komag, has become the basic process used in all disk drive designs.⁵³

Chen, currently Komag chair, has received the Arthur Young Entrepreneurial Success of a Business Founded by a Minority Award and the 1988 Entrepreneur of the Year Award from *Venture Magazine*. He has been credited with more than 15 patents.⁵⁴

Cadence Design Systems

Headquartered in San Jose, California, Cadence provides Electronic Design Automation software and services that automate and enhance the design of integrated circuits and electronic systems. Cadence currently leads this market with an estimated 18 percent market share.⁵⁵ The company reported revenues of \$429 million for fiscal year 1994, and has 2,600 employees worldwide with 1,600 based in the United States.

Yen-son (Paul) Huang, a native of Taiwan, co-founded ECAD, which merged with SDA Systems to form Cadence. He stepped down as executive vice president of research and development at Cadence in 1989, but remains a member of the board of directors and consultant to the company. Company president Joseph Costello considers Huang "one of Cadence's technical gurus since (its) inception and ECAD's primary technical officer since its founding." Huang has since co-founded another electronics company, PIE Design Systems.⁵⁶

Kingston Technology Corp.

Kingston Technology was founded by immigrants John Tu and David Sun. Based in Fountain Valley, a town in Southern California, the company manufacturers upgrade memory, processor, networking and storage products for personal computers. Kingston started in 1987 with only two employees and \$12,000 in annual sales and now has 450 employees. In 1992,

Inc. Magazine named Kingston the fastest growing, privately held company in America, and by 1995, sales revenues reached \$1 billion. The company is the largest minority-owned business in Orange County.⁵⁷

Kingston entered the industry in 1987 when the computer industry was suffering from a shortage in memory modules for personal computers. This shortage could have severely hampered the ability of computer manufacturers and users to acquire the memory necessary to upgrade their systems. Tu and Sun met this need by designing an industry standard Single in Line Memory Module (SLMM), using an alternate chip that was available.⁵⁸

Tu, who served as president of Kingston Technology since its founding, had previously co-founded Camminton Corporation with Sun, Kingston's vice president; Cammington was sold to AST Research. Sun immigrated to the United States from Taiwan after obtaining an electrical engineering degree.

Advanced Logic Research

Advanced Logic Research was founded in 1984, in Irvine, California, and designs, manufactures, markets, and supports computer systems targeted at the client/server and desktop markets. In 1995 the company reported its best quarterly and fiscal year results in four years, with sales revenue of \$192.4 million, compared to \$183.4 million the year before. It has 500 employees worldwide and approximately 400 employees in the United States.

Founder Gene Lu immigrated from Taiwan at age 9, and now serves as chair, chief executive officer, and president of the company. He studied electronics at Cal Poly Pomona and worked as an engineer at Micro Data, National Semiconductor, and Advanced Systems prior to founding Advanced Logic Research.⁵⁹

Gemstar Development Corporation

Gemstar Development was co-founded in 1986, by three immigrants: Daniel Kwoh, Wilson Cho, and Henry Yuen. It produces several consumer VCR products — including VCR++, a one-step solution to accurate VCR taping that has become the best selling consumer electronics product of the 1990s. The Pasadena-based enterprise employs 200 people; 100 are based in the United States. The company started with an initial investment of \$100,000 and its 1995 revenue exceeded \$40 million.⁶⁰

Kwoh came to the United States in 1966 as a student, became a U.S. citizen and earned a Master's and Doctorate in physics. Yuen and Kwoh both graduated from the California Institute of Technology and worked as

research scientists at TRW. Cho, a professor of physics at Hong Kong University, together with Yuen and Kwoh, developed the technology to make the VCR more user-friendly after Yuen had difficulty programming his own VCR. President Bush acknowledged the founders' achievement in a commencement address in 1991.⁶¹

Genelabs Technologies Inc.

Genelabs was established in 1984, in the Northern California town of Redwood City, California. The international biopharmaceutical and diagnostics company develops therapeutic and vaccine products for viral diseases, autoimmune disorders, and other life-threatening or -debilitating conditions. It also develops viral diagnostic products. The company reported revenues of \$16.5 million for 1994, and recently announced a joint venture with the Taiwan government to build a Genelabs subsidiary in Taiwan.⁶² Genelabs employs 150 people worldwide, with half based in the United States.

Co-founder and board chair Frank Kung was born in China and obtained his Master's and Doctoral degrees in molecular biology from the University of California, Berkeley. His postdoctoral training was in cell biology and immunology. Before co-founding Genelabs, Kung founded Clinical BioResearch and held positions in research planning and business development at Cetus Immune from 1979 to 1981. He sits on the boards of the Biotechnology Industry Organization and the National Biotechnology Policy Board of the National Institute of Health.⁶³

Netmanage

Netmanage is an internet software company, based in Cupertino, California. Zvi Alon, an immigrant from Israel, founded Netmanage and now serves as board chair and chief executive officer. The company experienced 180 percent growth from 1993 to 1994 and reported revenues of \$62 million. It employs 600 people worldwide, over 400 of whom work in the United States.⁶⁴

Sigma Designs Inc.

Sigma Designs Inc. was co-founded in 1982, by Think Tran, Jimmy Chan, and Jason Chen, immigrants from Vietnam, Hong Kong and Taiwan respectively. Tran is the chair and chief executive officer. The company, headquartered in Fremont, California, manufactures MPEG (Moving Picture Experts Group)-based multimedia products, including MPEG video and audio encoding and decoding devices, chip sets, and a full line of in-

teractive MPEG software titles. Sigma's sales revenue for 1995 was \$30 million. The enterprise has 75 employees worldwide with all but 5 people working in the United States.⁶⁵

Qume Corporation/Wyse Technology

Qume Corporation was founded in 1973, by David Lee, an immigrant from Taiwan. Qume, which produced terminals, monitors and printers was purchased by Wyse Technology, headquartered in San Jose, California, in December 1993. Wyse Technology was also founded by an immigrant. The company is a supplier of advanced video display terminal technology and high resolution desktop monitors. It employs 1400 people worldwide and 450 in the United States.⁶⁶

Action Instruments

James Pinto, a native of Bangalore, India, started Action Instruments in Kearny Mesa, California. Its core business is manufacturing instruments needed for the measurement and control of industrial processes. The privately-held company delivers its products throughout Europe, Asia, and North America. The company now employs 180 workers and has been recognized as one of the best employers in the United States by *Inc. Magazine* partly for its employee ownership program. The revenues for 1995 were \$21 million.⁶⁷

Pinto immigrated to the United States in the 1960s and brought with him a Master's degree in physics and several years experience working in the European electronics industry.⁶⁸

Conclusion

This paper has presented examples of numerous immigrants who have founded companies and played key roles in the high-tech industry by developing technology and creating jobs. Contrary to the popular view of immigrants engaging in narrow self-employment or running mom-and-pop shops, immigrant entrepreneurs discussed in this paper have created dynamic, successful high-tech companies that are leaders in the industry. The United States remains the center of innovation in most fields of high technology and has benefited from the immigration of energetic, capable and highly-motivated immigrants.

Importantly, the individuals highlighted entered in a variety of capacities. While many entered as foreign students, others entered as members of an immigrant family or as refugees. What they seemed to have in common were creativeness, ingenuity, and an enterprising spirit.

Notes

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