

Introduction

“Immigrants. We get the job done.”¹

This quote from the hit Broadway show, *Hamilton: The Musical*, epitomizes one of the core American portrayals of immigrants as hard-working people who come to the United States seeking economic, social, and personal opportunities and who are willing to work hard to achieve their goals. In the musical, the characters depicting Alexander Hamilton and Marquis de Lafayette were referring to immigrants at the time of the American Revolution nearly 250 years ago. Today, immigrants are currently the topic of intense controversy, with competing political narratives regarding their role in the US economy. One often neglected element in this controversy is the tremendous contribution to the US technology sector that has come from immigrants, particularly those who came after the Immigration Reform Act of 1965. These contributions have been well recognized in industry, as evidenced by the recent establishment of two organizations founded by prominent leaders of US technology companies advocating for immigration policies that would continue attracting and retaining scientific and technical professionals from abroad. One group, FWD.us, was founded by high-profile technology executives including Mark Zuckerberg of Facebook, Bill Gates of Microsoft, and Marissa Mayer of Yahoo. Another is Partnership for a New American Economy whose founders include former Microsoft CEO Steve Ballmer and former New York City mayor Michael Bloomberg who heads the huge diversified business communications company, Bloomberg L.P.

This book, *Hammer & Silicon: The Soviet Diaspora in the US Innovation Economy*, presents the story of one specific group of immigrants who were part of the global migration of talent attracted to the United States in the later decades of the twentieth century and early part

¹ Lin-Manuel Miranda, *Yorktown (The World Turned Upside Down)*. From *Hamilton: The Musical* (New York: Grand Central Publishing, 2015).

of the twenty-first century after US immigration reform. This talent pool helped fuel US economic growth and world leadership in high technology. Presented in this book are immigrants from the former Soviet Union who tell their stories of their generally unrecognized role in this era of US technology leadership.

About the Title

The title of this book incorporates two of the most powerful symbols of the twentieth century, one associated with the Soviet Union and the other with the United States. The hammer and sickle is well-known as the symbol of the USSR, and the silicon chip is widely used as a symbol of the high-technology industry in the United States. The full title of the book points to the emigration and brain drain before, and particularly during, the collapse of the Soviet Union and its impact on US science and technology. This process is illustrated through interviews with a remarkable and talented group of individuals who came to the United States and who ended up becoming significant contributors to the US technology sector.

The Soviet hammer of industry and sickle of agriculture were the symbolic representation of the forced transformation that turned the Russian Empire of the nineteenth-century czars into a world power. That symbol was intended to represent the worker–peasant alliance of social forces in an idealized depiction of the Soviet Union. As such, that symbol represented the command or centrally planned economy of the Soviet state and was ubiquitous in the country’s flag, documents, uniforms, and government buildings. In the post–World War II world, the Soviet Union began to emerge as a technological rival to the United States, particularly with the launch of the Sputnik space satellite in 1957. It was a rival with enormous human capital in science, engineering, and mathematics, one that was institutionalized in a network of state-financed universities, research institutes, laboratories, and specialized enterprises.

A major US response to this technological threat was the silicon chip, which became the building block of a transformational technological era. In the 1950s, the Santa Clara Valley on the San Francisco peninsula was the birthplace of the silicon chip, or silicon-based integrated circuit, and was the home of the world’s first silicon chip producer, Fairchild Semiconductor. The Soviet satellite launch was the impetus

for creating the National Aeronautics and Space Administration (NASA) in 1958 and also for increasing government spending to accelerate technology that depended on semiconductors. As a result, a large number of silicon chip or semiconductor companies sprang up in the San Francisco Bay Area, giving rise to the widely recognized designation “Silicon Valley” to much of the San Francisco peninsula. The technology developed there paved the way for the rapid development of the microprocessors that undergird the computer hardware, software, communications, and social media sectors, and also for a much broader blossoming of US innovation in biotech, medical instruments, robotics, and artificial intelligence. This technology explosion enabled the United States to leapfrog over the Soviet Union and, in many respects, contributed to the USSR’s economic demise.

Genesis of the Book

The authors have devoted the past thirty years to research, publication, presentations, and consulting on a wide variety of business and management issues in the Soviet Union and its successor countries. In doing so, it has been obvious to us that a significant number of technical professionals from that part of the world are now working in the US innovation economy, but this awareness is absent from most business and technology research, as well as in the popular press. Over the past decade, both immigration and innovation in general have become increasingly high-profile topics in the media, society, and the corporate world, as well as in academia. Recent studies by the Kauffman Foundation show conclusively that immigrants are twice as likely to found new businesses than are native-born Americans.² While this is a general measure of entrepreneurship, further work indicates the critical role of immigrants in the innovation process.

One of the seminal works on immigration and innovation was *The New Argonauts: Regional Advantage in a Global Economy* by AnnaLee Saxenian, published in 2006. That book focused on the critical role of immigrants from Taiwan, China, India, and Israel in Silicon Valley and their subsequent contributions back to their home

² “Kauffman Compilation: Research on Immigration and Entrepreneurship,” Ewing Marion Kauffman Foundation (October 2016), 3. <http://www.kauffman.org/what-we-do/resources/kauffman-compilation-research-on-immigration-and-entrepreneurship>.

countries. As explained in this book, the movement of these immigrants to Silicon Valley and the United States generally was not possible until after the US Immigration Reform Act of 1965. The Act's legal framework allowed for immigrants of all nationalities to enter the United States, including the influx resulting from the decline and dissolution of the Soviet Union. Missing from Professor Saxenian's insightful analysis and that of others was any mention of the ex-Soviet immigrants that we knew to also be part of this immigration–technology nexus. We know of no research that has been published on the impact of the Soviet diaspora on the US innovation economy. This book is the story of this exodus and its impact on the US technology sector in Silicon Valley and the Boston-Cambridge area.

We tell this story from both personal and professional points of view. Two authors who do not have direct family ties to Russia or the Soviet Union conceived this book. Professors Sheila Puffer and Daniel McCarthy have no family genealogy that can be traced to that part of the world. In writing the book, they were joined by Daniel Satinsky who has attenuated family ties to the Russian Empire through his grandparents on his father's side, who emigrated to the United States from Ukraine in 1911. All three authors' professional lives are entwined in the stories presented in this book.

Sheila Puffer, herself an immigrant, serendipitously began learning Russian as an undergraduate at Laurentian University in her native Canada on the recommendation of a professor to study that challenging language. That background led her to spend a year in the Soviet Union after completing her MBA, earning a diploma in management from the Plekhanov Institute of the National Economy in Moscow. Nearly a decade later, it was her good fortune to have worked with Professor Paul Lawrence of Harvard Business School in the late 1980s as an author of the book, *Behind the Factory Walls: Decision Making in Soviet and US Enterprises*,³ an opportunity that launched her research focus on the Soviet Union.

Daniel McCarthy became interested in business and management in the Soviet Union in the late 1980s, when Mikhail Gorbachev's *perestroika* and *glasnost* policies opened that country for research

³ Paul R. Lawrence, Charalambos A. Vlachoutsicos, Igor Faminsky, Eugene Brakov, Sheila Puffer, Alexander Naumov, Elise Walton, and Vitaly Ozira, *Behind the Factory Walls: Decision Making in Soviet and US Enterprises* (Boston: Harvard Business School Press, 1990).

opportunities, and Daniel and Sheila began doing research together. He later formed a connection at his Harvard alma mater to faculty members who had been involved in the famous Harvard Soviet Interview Project of the 1950s, including Abram Bergson and Joseph Berliner.⁴

Daniel Satinsky made his first trip to the Soviet Union on a study and travel trip for lawyers in 1984 and began serious involvement with joint venture businesses in the region after completing a mid-career master's degree at Tufts University's Fletcher School of Law and Diplomacy in 1991. In the two decades that followed, he traveled to the former Soviet Union more than 100 times, visiting many different locations in that enormous and varied country.

Together, the three authors have accumulated decades of experience engaged in study, publishing, business, and general interaction with people of the former Soviet Union. In doing so, they personally witnessed the dramatic historic events that took place there at the end of the twentieth and beginning of the twenty-first centuries and that span the major time period in this book.

Talent Flow from the USSR

In 2014, the authors conceived of a book to focus on the topic of the human impact on the US technology sector of the decline and collapse of the Soviet Union. The distinctive foundation of this book is the 157 in-depth interviews we conducted in the leading innovation hubs of Silicon Valley and the Boston-Cambridge area from January 2015 through March 2016. We developed a semistructured interview protocol of topics for interviews of an hour or more with each person, with most interviews running about an hour and a half and some as long as three hours. With a goal of 150 interviews, the authors interviewed seventy-nine entrepreneurs and other technical professionals in Silicon Valley and conducted an additional seventy-eight interviews with a comparable group in the Boston-Cambridge area. The 157 interviewees came to the United States over roughly the past forty years from eleven of the fifteen republics of the former Soviet Union. Of those, forty-three, or 27 percent, were women. These individuals arrived in the United States in what we have designated as three waves from the 1970s through 2015.

⁴ Harvard Project on the Soviet Social System. <http://hcl.harvard.edu/collections/hpss/about.html>

In analyzing the information collected through the interviews, we have utilized established social science conceptual tools. Specifically, we apply institutional theory, imprinting theory, and identity theory to explore the complexities underlying the significant role played by the Soviet diaspora in the technology sectors of the US economy. The book probes how Soviet institutions and institutional voids, as well as imprinting from Soviet times and its aftermath, were instrumental in shaping the identities of our interviewees. We have also placed this process in the historical context of the times and the consequent impact on who emigrated, why they emigrated, and how they ended up in the United States. Based on this analysis, the book explores the rich interview narratives regarding the immigration experience and work-related experiences such as entrepreneurial activities, mentoring, and teamwork, as well as how interviewees overcame obstacles and sought opportunities to utilize their technological and scientific expertise. Some interviewees were sponsored by US employers while others held refugee, student, investor, or exceptional talent visas. We have utilized the term “immigrant” and the related terms “immigration” and “emigration” rather loosely since not all interviewees held the status of immigrant, with some not choosing to do so and others unable to do so at the time of the interview. Like French General Lafayette, mentioned at the outset of this Introduction, these individuals did not have US citizenship, yet they contributed significantly to the country. Others were like Alexander Hamilton, the first secretary of the US treasury, who emigrated from the British West Indies and became a citizen.

In presenting the various chapters, we have excerpted sections of the interviews that highlight interesting and important aspects of individuals’ experiences in the former Soviet Union and in the United States, as well as during their immigration experience. Many interviewees have quotes in multiple chapters. While we would have liked to feature each person on every topic, we had to make difficult decisions about which portions of the interviews to include. We also emphasize that the interviewees constitute a convenience sample rather than a statistically based sample of the population.

Commonality of Interviewees

The individuals included in this book represent many different nationalities, religions, and cultural backgrounds, as well as different histories and circumstances, reflecting the vast expanse of the Soviet Union. In

addition, there has been growing differentiation of the independent countries' paths of development after the dissolution of the Soviet Union. This is particularly acute in the differences between Ukraine and the Russian Federation even before the 2013 Maidan protests and change of government in Ukraine. Amid this complexity, we have also observed strong elements of commonality that come from the interviewees' shared Soviet history, culture, and educational system, as well as the Russian language.

We acknowledge a bias in our presentation of an emphasis on the Russian Federation that reflects the numbers and the power concentrated there as the center of the former Soviet government and its continuing dominating influence as the largest, by geography and population, of the independent countries formed after the dissolution of the USSR in 1991. However, our interviewees come from throughout the former Soviet Union, and we have included overviews of relevant developments in other countries, primarily in Ukraine, Belarus, Georgia, Armenia, and Kazakhstan as the main centers of post-Soviet emigration. The Baltic countries of Latvia, Lithuania, and Estonia have a separate historical trajectory and less connection to Soviet culture and institutions and thus are not covered with the same level of detail.

For those who came to the United States in this time period, the influence of the Soviet past remains very strong, although producing differing effects and reactions. In order to describe the commonalities of this group while respecting the individual differences of nationality, culture, and individual personality, we have focused on the common elements that were forged through the overlay of the Soviet system. This overlay consists of common institutional experiences of the highly centralized and standardized Soviet Union, a common educational system, and common cultural reference points that come from the centralized Soviet political and administrative systems. The other element that binds them together is the Russian language as the state language and lingua franca of the diverse nationalities and religions that were contained within the Soviet Union. Regardless of their attitudes toward the Soviet system from a political point of view, these individuals share a common background that influenced both their opportunities in the US technology sector and their adaptation to the country's innovative and entrepreneurial business culture.

Changing geographical and statistical methods during this period complicate the task of presenting an accurate numerical picture for all three waves. Prior to 2000, US immigration statistics counted all immigrants from the Soviet Union as having that country of origin despite the fact that the Soviet Union dissolved in 1989. Thus, it is very difficult to construct an accurate picture for the 1990s. After 2000, statistics have been recorded on the basis of the fifteen new countries that emerged. For our purposes, only the total numbers of immigrants for the three waves are presented in order to give an idea of magnitude, if not a precise statistic. We have used indicative numbers where possible to give this overall picture.

We use the terms “Soviet Union” and “USSR” interchangeably, as well as the terms the “former Soviet Union” and the “former USSR.” We also use the terms “Russian Revolution” and “Bolshevik Revolution” interchangeably to refer to the 1917 revolution that overthrew the czars. In presenting names of cities and regions, we use the Russian spelling and the name of that city or region contemporaneous with the speaker. We recognize that the names used for cities can have strong political undertones. A number of cities in the former Russian Empire had their names changed by the Soviets to honor Bolshevik or revolutionary figures. For instance, St. Petersburg became Leningrad and Nizhny Novgorod became Gorky. Most such names were restored to their prerevolutionary status after the dissolution of the USSR. Our interviewees sometimes use the old name and sometimes the Soviet name. We have left the name as it was at the time they were referring to it, but use the contemporary name when speaking about the present. We are also aware of the sensitivity of spelling city and other place names in national languages other than Russian. We have chosen to use the transliteration of the Russian spelling since it is the most recognizable to Western readers. To give readers an appreciation for the wide variety of locations in which our interviewees were born, we have created a map⁵ of the former Soviet Union indicating their birthplaces, and also include an enlarged view of the highly populated western region. Interviewees’ birthplaces spanned the entire length and breadth of that vast country: from Murmansk, Russia, the world’s largest city north of the Arctic circle; to Meghri, Armenia, in the south near the

⁵ Map developed by Carol Fraser and Dorian Scheidt using Tableau Maps, © 2018. www.tableau.com. Used with permission. Birthplaces added by the authors.

border with Iran; and from Kaliningrad, the far western territory separated from the rest of Russia by Belarus; to the remote settlement of Egvekinot, the most easterly outpost of Russia located on the Bering Sea. And while recognizing that Siberia is part of Russia, we specify Siberia when appropriate in recognition of that vast geographical territory and its distinct culture within Russia. The 157 interviewees were born in eleven of the fifteen Soviet republics: Russia (106); Ukraine (23); Belarus (6); Armenia (5); Uzbekistan (4); Moldova and Georgia (3 each); Kazakhstan, Estonia, and Latvia (2 each); and Azerbaijan (1). No interviewees were born in Lithuania, Kyrgyzstan, Tajikistan, or Turkmenistan. As for cities, 44 percent of interviewees were born in Moscow (52) or St. Petersburg (18). The Ukrainian cities of Kharkov (7) and Kiev (5) were next, followed by Novosibirsk, Tashkent, and Yerevan with four each. The remaining cities had three or fewer interviewees born in that location.

We also note that we have highlighted in bold the names of interviewees when introducing their quotes for ease of locating them in the text. When they are referred to in contexts where they are not quoted, we have kept their names in regular typeface. In each chapter, the type of descriptive information included about the interviewees, such as age at the time of coming to the United States and current position title, varies according to its usefulness in putting their comments in context.

Technology Sector Impact

This book is not meant to be a systematic, statistical study of technology companies started by immigrants from the former Soviet Union nor of other companies to which they have made major contributions. However, we will illustrate their contributions anecdotally through interview excerpts. Immigrants from the former Soviet Union historically have had a significant impact on company formation in the United States, with a 2011 study by the Partnership for a New Economy reporting that they or their children founded twenty-eight Fortune 500 companies, including Google, Oracle, United Technologies, Occidental Petroleum, Qwest Communications, Omnicom Group, Avnet, Viacom, Home Depot, CBS, and Polo Ralph Lauren.⁶ Other

⁶ Steven A. Ballmer et al., Co-chairs of the Partnership for a New American Economy, *The “New American” Fortune 500*, Partnership for a New Economy

technical and scientific contributions of major importance to the innovation economy include those of Soviet immigrants Alexander Poniatoff, the 1940s founder of the audiotape manufacturing firm Ampex, and Yakov Rekhter, the 1980s codesigner of BGP, the core routing protocol of the Internet.

Our interviewees' contributions range from professional positions in iconic companies like Google, Facebook, Apple, and Microsoft; to founding industry leaders like IPG Photonics and PTC; to initiating numerous startups and conducting groundbreaking research for the products of the future. As a result of their strong educational backgrounds in mathematics and basic science, the majority of them are clustered in biotech, pharma, and medical products, as well as software, IT, communications, and the Internet. Also notable is the significant number who became serial entrepreneurs, angel investors, and venture capitalists engaged in fueling next-generation innovation.

Themes of the Book: The Five I's

The themes of the book are centered on five i's: immigration, innovation, institutions, imprinting, and identity. We discuss each one below.

Immigration

This book focuses on immigration from the former Soviet Union to the United States that took place beginning in the early 1970s through 2015, and, within that immigration, on those who contributed to the high-technology sector. To put this story in context, we review the overall patterns of emigration from the USSR during this period and the corresponding patterns of immigration to the United States. The research and interviews made it clear that within this period of time there were actually three separate waves that corresponded to different geopolitical conditions affecting the Soviet Union and the successor states that emerged after the country's dissolution.

The First Wave, from 1972 to 1986, was primarily Soviet Jews. During this period, the number of Soviet Jews allowed to emigrate fluctuated depending on the state of relations between the USSR and

(no location, June 2011). http://www.nyc.gov/html/om/pdf/2011/partnership_for_a_new_american_economy_fortune_500.pdf