START-UP NATION

The Story of Israel's Economic Miracle

DAN SENOR AND SAUL SINGER

A Council on Foreign Relations Book

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To Campbell Brown and Wendy Singer, who shared our enthusiasm for this story

To James Senor and Alex Singer, who would have marveled at what they worked t
create.

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AUTHORS' NOTE

This is a book about innovation and entrepreneurship, and how one small country, Israel, came t embody both.

This is not a book about technology, even though we feature many high-tech companies. Whi we are fascinated by technology and its impact on the modern age, our focus is the ecosystem th generates radically new business ideas.

This book is part exploration, part argument, and part storytelling. The reader might expect th book to be organized chronologically, around companies, or according to the various key elemen that we have identified in Israel's model for innovation. These organizational blueprints tempted u but we ultimately rejected them all in favor of a more mosaiclike approach.

We examine history and culture, and use selected stories of companies to try to understand wher all of this creative energy came from and the forms in which it is expressed. We have interviewe economists and studied their perspectives, but we come at our subject as students of history, busines and geopolitics. One of us (Dan) has a background in business and government, the other (Saul) government and journalism. Dan lives in New York and has studied in Israel and lived, worked, an traveled in the Arab world; Saul grew up in the United States and now lives in Jerusalem.

Dan has invested in Israeli companies. None of these companies are profiled in this book, b some people Dan has invested with are. We will note this where appropriate.

While our admiration for the untold story of what Israel has accomplished economically was big part of what motivated us to write this book, we do cover areas where Israel has fallen behind. W also examine threats to Israel's continued success—most of which will likely surprise the reade since they do not relate to those that generally preoccupy the international press.

We delve briefly into two other areas: why American innovation industries have not taken bette advantage of the entrepreneurial talent offered by those with U.S. military training and experience, contrast to the practice in the Israeli economy; and why the Arab world is having difficulty fostering entrepreneurship. These subjects deserve in-depth treatment beyond the scope of this boo entire books could be written about each.

Finally, if there is one story that has been largely missed despite the extensive media coverage Israel, it is that key economic metrics demonstrate that Israel represents the greatest concentration innovation and entrepreneurship in the world today.

This book is our attempt to explain that phenomenon.

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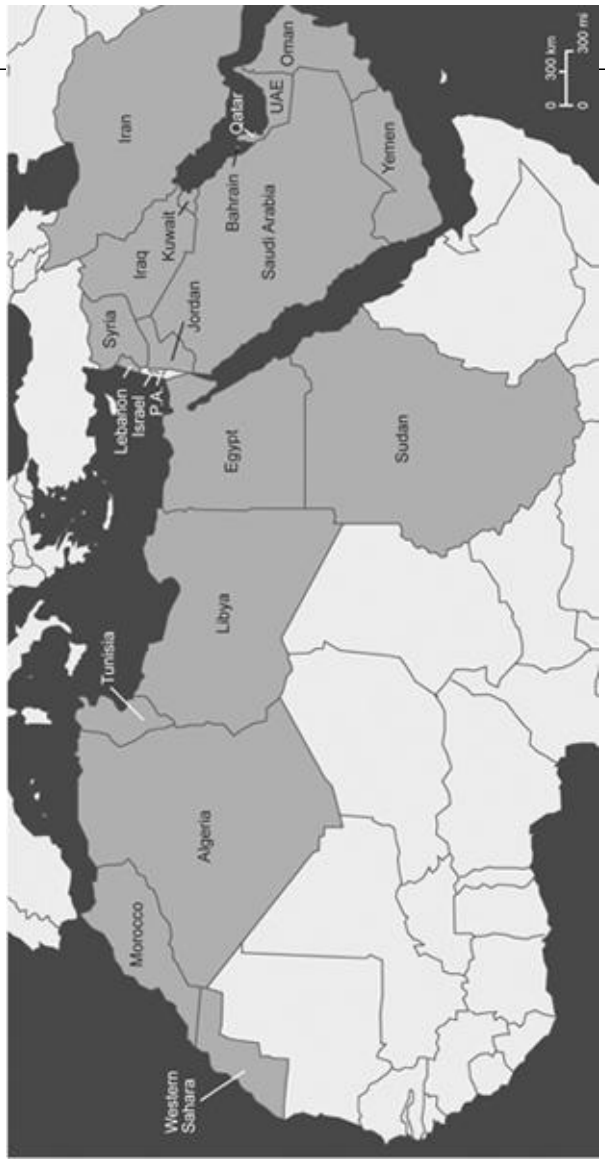

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Introduction

Nice speech, but what are you going to do?

—Shimon Peres to Shai Agassi

The two men made an odd couple as they sat, waiting, in an elegant suite in the Sheraton Seehof, high up in th Swiss Alps. There was no time to cut the tension with small talk; they just exchanged nervous glance The older man, more than twice the age of the younger and not one to become easily discouraged, w the calmer of the two. The younger man normally exuded the self-confidence that comes with bein the smartest person in the room, but repeated rejections had begun to foster doubt in his mind: Woul he really be able to pull off reinventing three megaindustries? He was anxious for the next meeting begin.

It was not clear why the older man was subjecting himself to this kind of hassle and to the risk humiliation. He was the world's most famous living Israeli, an erudite two-time prime minister an Nobel Prize winner. At eighty-three years old, Shimon Peres certainly did not need another adventure

Just securing these meetings had been a challenge. Shimon Peres was a perennial fixture at th annual Davos World Economic Forum. For the press, waiting to see whether this or that Ara potentate would shake Peres's hand was an easy source of drama at what was otherwise a dressed-u business conference. He was one of the famous leaders CEOs typically wanted to meet.

So when Peres invited the CEOs of the world's five largest carmakers to meet with him, h expected that they would show up. But it was early 2007, the global financial crisis was not yet on th horizon, the auto industry was not feeling the pressure it would a year later, and the American Bi Three—GM, Ford, and Chrysler—didn't bother to respond. Another top automaker had arrived, b he'd spent the entire twenty-five minutes explaining that Peres's idea would never work. He wasn interested in hearing about the Israeli leader's utopian scheme to switch the world over to full electric vehicles, and even if he had been, he wouldn't dream of launching it in a tiny country lik Israel. "Look, I've read Shai's paper," the auto executive told Peres, referring to the white paper Pere had sent with the invitation. "He's fantasizing. There is no car like that. We've tried it, and it can't b built." He went on to explain that hybrid cars were the only realistic solution.

Shai Agassi was the younger man making the pitch alongside Peres. At the time, Agassi was a executive at SAP, the largest enterprise software company in the world. Agassi had joined the Germa tech giant in 2000, after it bought his Israeli start-up, TopTier Software, for $400 million. The sale ha proved that though the tech bubble had just burst, some Israeli companies could still garner precras values.

Agassi founded TopTier when he was twenty-four. Fifteen years later, he headed two SA subsidiaries, was the youngest and only non-German member of SAP's board, and had been shor listed for CEO. Even if he missed the ring at thirty-nine, he could be pretty confident that someday would be his.

Yet here Agassi was, with the next president of Israel, trying to instruct an auto executive on th future of the auto industry. Even he was beginning to wonder if this entire idea was preposterou especially since it had begun as nothing more than a thought experiment.

At what Agassi calls “Baby Davos”—the Forum for Young Leaders—two years before, he ha taken seriously a challenge to the group to come up with a way to make the world a “better place” b 2030. Most participants proposed tweaks to their businesses. Agassi came up with an idea s ambitious that most people thought him naive. “I decided that the most important thing to do was figure out how to take a single country off of oil,” he told us.

Agassi believed that if just one country was able to become completely oil-independent, th world would follow. The first step was to find a way to run cars without oil.

This alone was not a revolutionary insight.

He explored some exotic technologies for powering cars, such as hydrogen fuel cells, but they a seemed like they would forever be ten years away. So Agassi decided to focus on the simplest syste of all: battery-powered electric vehicles. The concept was one that had been rejected in the past as to limiting and expensive, but Agassi thought he had a solution to make the electric car not just viab for consumers but preferable. If electric cars could be as cheap, convenient, and powerful as gas car who wouldn’t want one?

Something about coming from an embattled sliver of a country—home to just one on thousandth of the world’s population—makes Israelis skeptical of conventional explanations abo what is possible. If the essence of the Israeli condition, as Peres later told us, was to be “dissatisfied then Agassi typified Israel’s national ethos.

But if not for Peres, even Agassi might not have dared to pursue his own idea. After hearin Agassi make his pitch for oil independence, Peres called him and said, “Nice speech, but what are yo going to *do*?”[1]

Until that point, Agassi says, he “was merely solving a puzzle”—the problem was still just thought experiment. But Peres put the challenge before him in clear terms: “Can you really do it? there anything more important than getting the world off oil? Who will do it if you don’t?” An finally, Peres added, “What can I do to help?”[2]

Peres was serious about helping. Just after Christmas 2006 and into the first few days of 2007, h orchestrated for Agassi a whirlwind of more than fifty meetings with Israel’s top industry an government leaders, including the prime minister. “Each morning, we would meet at his office and would debrief him on the previous day’s meetings, and he’d get on the phone and begin scheduling th next day’s meetings,” Agassi told us. “These are appointments I could never have gotten witho Peres.”

Peres also sent letters to the five biggest automakers, along with Agassi’s concept paper, whic was how they found themselves in a Swiss hotel room, waiting on what was likely to be their la chance. “Up until that first meeting,” Agassi said, “Peres had only heard about the concept from me, software guy. What did I know? But he took a risk on me.” The Davos meetings were the first tim Peres had personally tested the idea on people who actually worked in the auto industry. And the fir industry executive they’d met had not only shot down the idea but spent most of the meeting trying talk Peres out of pursuing it. Agassi was mortified. “I had completely embarrassed this internation statesman,” he said. “I made him look like he did not know what he was talking about.”

But now their second appointment was about to begin. Carlos Ghosn, the CEO of Renault an Nissan, had a reputation in the business world as a premier turnaround artist. Born in Brazil Lebanese parents, he is famous in Japan for taking charge of Nissan, which was suffering massiv losses, and in two years turning a profit. The grateful Japanese reciprocated by basing a comic-boo series on his life.

Peres began to speak so softly that Ghosn could barely hear him, but Agassi was astounded. Aft the pounding they had just received in the previous meeting, Agassi expected that Peres might sa something like, “Shai has this crazy idea about building an electric grid. I’ll let him explain it, a you can tell him what you think.” But rather than pulling back, Peres grew even more energetic tha before in making the pitch, and more forceful.

Oil is finished, he said; it may still be coming out of the ground, but the world doesn’t want anymore. More importantly, Peres told Ghosn, it is financing international terrorism and instabilit “We don’t need to defend against incoming Katyusha rockets,” he pointed out, “if we can figure o how to cut off the funding that launches them in the first place.”

Then Peres tried to preempt the argument that the technology alternative just didn’t exist yet. H knew that all the big car companies were flirting with a bizarre crop of electric mutations—hybrid plug-in hybrids, tiny electric vehicles—but none of them heralded a new era in motor vehic technology.

Just then, again about five minutes into Peres’s pitch, the visitor stopped him. “Look, Mr. Peres Ghosn said, “I read Shai’s paper”—Agassi and Peres tried not to wince, but they felt they knew whe this meeting was heading—“and he is absolutely right. We are exactly on the same page. We think th future is electric. We have the car, and we think we have the battery.”

Peres was almost caught speechless. Just minutes ago they’d received an impassioned lecture o why the fully electric car would never work and why hybrids were the way to go. But Peres and Agas knew that hybrids were a road to nowhere. What’s the point of a car with two separate power plants Existing hybrids cost a fortune and increase fuel efficiency by only 20 percent. They wouldn’t g countries off oil. In Peres and Agassi’s view, hybrids were like treating a gunshot wound with a Band aid.

But they had never heard all this from an actual carmaker. Peres couldn’t help blurting out, “S what do you think of hybrids?”

“I think they make no sense,” Ghosn said confidently. “A hybrid is like a mermaid: if you want fish, you get a woman; if you want a woman, you get a fish.”

The laughter from Peres and Agassi was genuine, mixed with a large dose of relief. Had the found a true partner for their vision? Now it was Ghosn’s turn to be worried. Though he wa optimistic, all the classic obstacles to electric vehicles still remained: the batteries were to expensive, they had a range less than half that of a tank of gas, and they took hours to recharge. S long as consumers were being asked to pay a premium in price and convenience, clean cars wou remain a niche market.

Peres said that he’d had all the same misgivings, until he had met Agassi. This was Agassi’s cu to explain how all these liabilities could be addressed using existing technology, not some mirac battery that wouldn’t be available for decades.

Ghosn’s attention shifted from Peres to Agassi, who dove right in.

Agassi explained his idea, as simple as it was radical: electric cars *seemed* expensive on because batteries were expensive. But selling the car with the battery is like trying to sell gas cars wi enough gasoline to run them for several years. When you factor in operating costs, electric cars a actually much cheaper—seven cents a mile for electric (including both the battery and the electrici to charge it) compared to ten cents a mile for gas, assuming gas costs $2.50 a gallon. If the price gas is as high as $4.00 per gallon, this cost gap becomes a chasm. But what if you didn’t have to pa for the battery when you bought the car and—as with any other fuel—spread the cost of the batte over the life of the car? Electric cars could become at least as cheap as gasoline cars, and the cost the battery *with* the electricity to charge it would be significantly cheaper than what people were use to paying at the pump. Suddenly, the economics of the electric car would turn upside dow

Furthermore, over the long run, this already sizable electric cost advantage would be certain increase as batteries became cheaper.

Overcoming the price barrier was the biggest breakthrough, but it wasn't sufficient for electr vehicles to become, as Agassi called it, the "Car 2.0" that would replace the transportation mod introduced by Henry Ford almost a century ago. A five-minute fill-up will last a gas car three hundre miles. How, Ghosn wondered, can an electric car compete with that?

Agassi's solution was infrastructure: wire thousands of parking spots, build battery swap station and coordinate it all over a new "smart grid." In most cases, charging the car at home and the offi would easily be enough to get you through the day. On longer drives, you could pull into a swa station and be off with a fully charged battery in the time it takes to fill a tank of gas. He'd recruited former Israeli army general—a man skilled at managing complex military logistics—to become t company's local Israeli CEO and lead the planning for the grid and the national network charging/parking spots.

The key to the model would be that consumers would own their cars, but Agassi's start-up, calle Better Place, would own the batteries. "Here's how it works," he later explained. "Think cell phone You go to a cell provider. If you want, you can pay full price for a phone and make no commitmen But most people commit for two or three years and get a subsidized or free phone. They end up payi for the phone as they pay for their minutes of air time."[3]

Electric vehicles, Agassi explained, could work the same way: Better Place would be like cellular provider. You would walk in to a car dealer, sign up for a plan based on miles instead minutes, and get an electric car. But the buyer wouldn't own the car battery; Better Place would. S the company could spread the cost of the battery—and the car, too—over four or more years. For t price consumers are used to paying each month for gas, they could pay for the battery and t electricity needed to run it. "You get to go completely green for less than it costs to buy and run a g car," Agassi said.

Agassi picked up where Peres had left off on another question: Why start with Israel, of a places? The first reason was size, he told Ghosn. Israel was the perfect "beta" country for electric ca Not only was it small but, due to the hostility of its neighbors, it was a sealed "transportation island Because Israelis could not drive beyond their national borders, their driving distances were alwa within one of the world's smallest national spaces. This limited the number of battery swap statio Better Place would have to build in the early phase. By isolating Israel, Agassi told us with an impi smile, Israel's adversaries had actually created the perfect laboratory to test ideas.

Second, Israelis understand not only the financial and environmental costs of being dependent oil but also the security costs of pumping money into the coffers of less-than-savory regimes. Thir Israelis are natural early adopters—they were recently number one in the world in time spent on t Internet and have a cell phone penetration of 125 percent, meaning lots of people have more than one

No less importantly, Agassi knew that in Israel he would find the resources he needed to tack the tricky software challenge of creating a "smart grid" that could direct cars to open charging spo and manage the charging of millions of cars without overloading the system. Israel, the country wi the highest concentration of engineers and research and development spending in the world, was natural place to attempt this. Agassi actually wanted to go even further. After all, if Intel could mas produce its most sophisticated chips in Israel, why couldn't Renault-Nissan build cars there? Ghosn response was that it would work only if they could produce at least fifty thousand cars a year. Per didn't blink, and committed to an annual production of one hundred thousand cars. Ghosn was board, provided Peres could make good on his promise.

Agassi was caught between three possible commitments. He needed a country, a car compan and the money, but to get any one of them he first needed the other two. For example, when Peres a

Agassi had gone to then prime minister Ehud Olmert to secure his commitment to make Israel the fir country to free itself from oil, the premier had set two conditions: Agassi had to sign on a top-fiv carmaker and raise the $200 million needed to develop the smart grid, turning half a million parkin spaces into charging spots, and building swap stations. Now Agassi had the carmaker, and it was tim to fulfill Olmert's second condition: money.

Still, Agassi had heard enough to believe that his idea could take off. Stunning the tech world, h quit his job at SAP to found Better Place. (It took four conversations to convince the SAP manageme that he was serious about quitting.)

But investors around the globe were not jumping at a plan that involved reimagining some of th largest, most powerful industries in the world: cars, oil, and electricity. Plus, since the cars wer useless without the infrastructure, the charging grid would have to be developed and deployed *befo* the cars were released in significant numbers. That meant spending most of the $200 million to wi the entire country up front—an enormous capital expenditure that would make investors' heads spi Ever since the tech bubble had burst in 2000, venture capitalists were much less venturesome; no on wanted to spend tons of money up front, well before the first dollar of revenue showed up.

Except for one investor, that is—Israeli billionaire Idan Ofer, who had just made the largest eve Israeli investment in China by buying a major stake in the Chinese car manufacturer Che Automobile. Six months before, Ofer had also bought an oil refinery. So he knew a thing or two abou the auto and oil industries. When Mike Granoff, an early American investor in Better Place, suggeste tapping Ofer, Agassi said, "Why would he help me put him out of his two newest businesses?" Bu Agassi had nothing to lose.

Forty-five minutes into their meeting, Ofer told Agassi he was in for $100 million. He lat increased his stake by another $30 million and told his Chinese auto team he wanted it to bui electric cars.

Agassi raised the $200 million, making Better Place the fifth-largest start-up in history.[4] Wi Israel in place as the first test case, others were quick to follow. As of this writing, Denmar Australia, the San Francisco Bay Area, Hawaii, and Ontario—Canada's most populous province- have all announced that they will join the Better Place plan. Better Place was the only foreig company asked to compete in developing an electric vehicle system for Japan, a highly unusual ste for the historically protectionist Japanese government.

Among the many skeptics is Thomas Weber, the Mercedes research and development chief. H said that in 1972 his company had actually built an electric bus with a swappable battery, called th LE 306, and discovered that changing a battery could cause electrocution or fire.

Better Place's answer has been a working battery swap station. Using one is like pulling into a c wash. Only, once the driver pulls in, a large rectangular metal plate—much like the lifts at the bac end of moving trucks—rises up from underneath the car. The car then retracts the thick two-inc metal hooks securing the enormous blue battery, releasing it so it rests on the plate. The plate move back down, drops the spent battery in a charging station, picks up a full battery, and lifts it into plac under the car. Total time for the completed automated swap: sixty-five seconds.

Agassi is proud of how his team solved the engineering problem of precisely, instantly, an reliably releasing a battery that weighs hundreds of pounds. They employed the same hooks used hold five-hundred-pound bombs in place on air force bombers. There was no room for error in bomb-release mechanism; the battery would be just as secure, yet removable, in electric cars.

If it succeeds, the global impact of Better Place on economics, politics, and the environme might well transcend that of the most important technology companies in the world. And the idea wi have spread from Israel throughout the world.

Companies like Better Place and entrepreneurs like Shai Agassi don't appear every day. Yet

glance at Israel shows why it is not so surprising that, as Boston's Battery Ventures investor Sco Tobin predicted, "the next big idea will come from Israel."[5]

Technology companies and global investors are beating a path to Israel and finding uniqu combinations of audacity, creativity, and drive everywhere they look. Which may explain why, i addition to boasting the highest density of start-ups in the world (a total of 3,850 start-ups, one f every 1,844 Israelis),[6] more Israeli companies are listed on the NASDAQ exchange than all compani from the entire European continent.

And it's not just the New York stock exchanges that have been drawn to Israel, but also the mos critical and fungible measure of technological promise: venture capital.

In 2008, per capita venture capital investments in Israel were 2.5 times greater than in the Unite States, more than 30 times greater than in Europe, 80 times greater than in China, and 350 tim greater than in India. Comparing absolute numbers, Israel—a country of just 7.1 million people- attracted close to $2 billion in venture capital, as much as flowed to the United Kingdom's 61 millio citizens or to the 145 million people living in Germany and France combined.[7] And Israel is the on country to experience a meaningful increase in venture capital from 2007 to 2008, as figure I shows.[8]

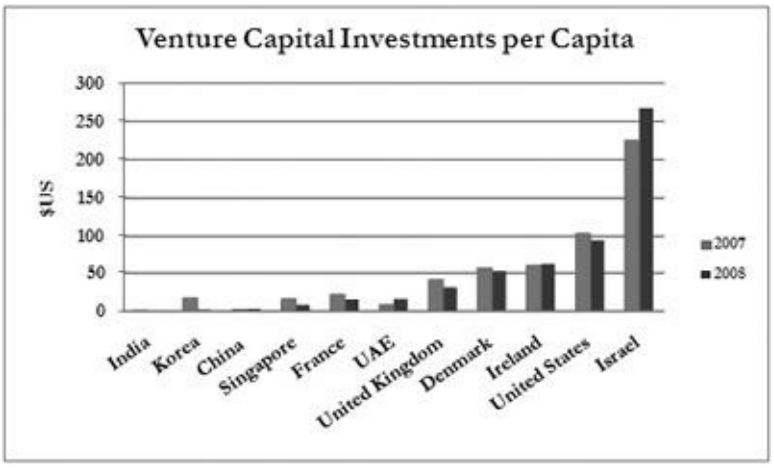

Figure I.1. ***Sources:*** **Dow Jones, VentureSource; Thomson Reuters; U.S. Central Intelligenc Agency,** ***World Fact Book*****, 2007, 2008.**

After the United States, Israel has more companies listed on the NASDAQ than any other count in the world, including India, China, Korea, Singapore, and Ireland, as figure I.2 shows. And, as figu I.3 makes clear, Israel is the world leader in the percentage of the economy that is spent on researc and development.

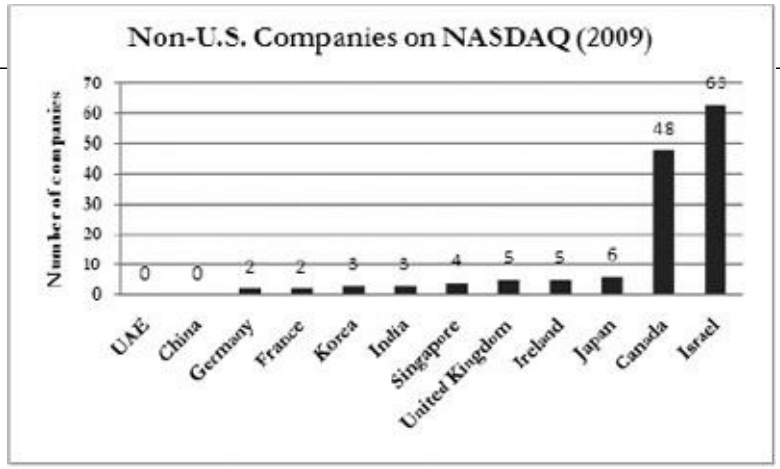

Figure I.2. ***Source:*** **NASDAQ, http://www.nasdaq.com/asp/ NonUsOutput.asp, May 2009.**

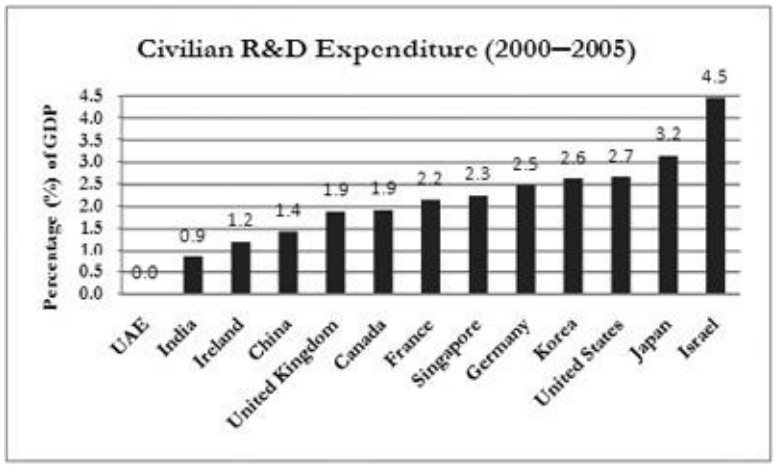

Figure I.3. ***Source:*** **UNDP (United Nations Development Programme) Report, 2007/2008.**

Israel's economy has also grown faster than the average for the developed economies of th world in most years since 1995, as a chart on page 14 illustrates (figure I.4).

Even the wars Israel has repeatedly fought have not slowed the country down. During the s years following 2000, Israel was hit not just by the bursting of the global tech bubble but by the mo intense period of terrorist attacks in its history and by the second Lebanon war. Yet Israel's share o the global venture capital market did not drop—it *doubled*, from 15 percent to 31 percent. And the T Aviv stock exchange was higher on the last day of the Lebanon war than on the first, as it was after th three-week military operation in the Gaza Strip in 2009.

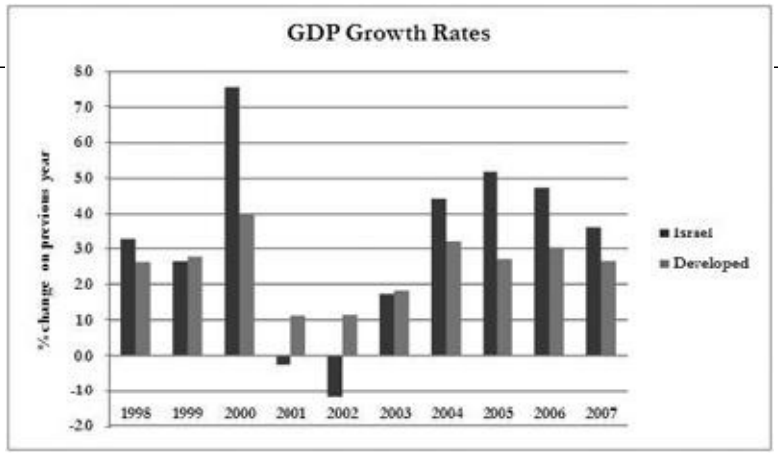

Figure I.4. ***Sources:*** **"Miracles and Mirages,"** ***Economist*****, April 13, 2008; "GDP Growth Rates by Country and Region, 1970–2007," Swivel, http://www.swivel.com/data_columns/spreadsheet/2085677.**

The Israeli economic story becomes even more curious when one considers the nation's dire sta just a little over a half century ago. Shai Agassi's family immigrated to Israel from Iraq in 1950, tw years after Israel's founding. The Agassis were part of a flood of a million refugees fleeing as a wav of violent pogroms swept the Arab world after the State of Israel's founding. At the time, the fledglin Jewish state simultaneously faced two seemingly insurmountable challenges: fighting an existenti war for independence and absorbing masses of refugees from postwar Europe and the surroundin Arab countries.

Israel's population doubled in the first two years of its existence. Over the next seven years, th country grew by another third. Two out of three Israelis were new arrivals. Right off the boat, mar refugees were given a gun they had no idea how to use and sent to fight. Some of those who ha survived Nazi concentration camps fell in battle even before their names could be recorde Proportionately, more Israelis died in the war for Israel's establishment than Americans in both worl wars combined.

Those who survived had to struggle to thrive in a stagnant economy. "Everything was rationed complained one new arrival. "We had coupon books, one egg a week, long lines."[9] The averag standard of living for Israelis was comparable to that of Americans in the 1800s.[10] How, then, did th "start-up" state not only survive but morph from a besieged backwater to a high-tech powerhouse th has achieved fiftyfold economic growth in sixty years? How did a community of penniless refuge transform a land that Mark Twain described as a "desolate country . . . a silent, mournful expanse," into one of the most dynamic entrepreneurial economies in the world?

The fact that this question has been treated only in piecemeal fashion is unbelievable to Israe political economist Gidi Grinstein: "Look, we doubled our economic situation relative to Americ while multiplying our population fivefold and fighting three wars. This is totally unmatched in th economic history of the world." And, he told us, the Israeli entrepreneur continues to perform unimaginable ways.[12]

While the Holy Land has for centuries attracted pilgrims, lately it has been flooded by seekers a different sort. Google's CEO and chairman, Eric Schmidt, told us that the United States is th number one place in the world for entrepreneurs, but "after the U.S., Israel is the best." Microsoft Steve Ballmer has called Microsoft "an Israeli company as much as an American company" becaus of the size and centrality of its Israeli teams.[13] Warren Buffett, the apostle of risk aversion, broke h

decades-long record of not buying any foreign company with the purchase of an Israeli company—f
$4.5 billion—just as Israel began to fight the 2006 Lebanon war.

It is impossible for major technology companies to ignore Israel, and most haven't; almost ha
of the world's top technology companies have bought start-ups or opened research and developme
centers in Israel. Cisco alone has acquired nine Israeli companies and is looking to buy more.[14]

"In two days in Israel, I saw more opportunities than in a year in the rest of the world," said Pa
Smith, senior vice president of Philips Medical.[15] Gary Shainberg, British Telecom's VP fo
technology and innovation, told us, "There are more new innovative ideas, as opposed to recycle
ideas—or old ideas repackaged in a new box—coming out of Israel than there are out in [Silico
Valley now. And it doesn't slow during global economic downturns."[16]

Though Israel's technology story is becoming more widely known, those exposed to it for th
first time are invariably baffled. As an NBC Universal vice president sent to scout for Israeli digit
media companies wondered, "Why is all this happening in Israel? I've never seen so much chaos an
so much innovation all in one tiny place."[17]

That is the mystery this book aims to solve. Why Israel and not elsewhere?

One explanation is that adversity, like necessity, breeds inventiveness. Other small an
threatened countries, such as South Korea, Singapore, and Taiwan, can also boast growth records th
are as impressive as Israel's. But none of them have produced an entrepreneurial culture—not
mention an array of start-ups—that compares with Israel's.

Some people conjecture that there is something specifically Jewish at work. The notion that Jew
are "smart" has become deeply embedded in the Western psyche. We saw this ourselves; when we to
people we were writing a book about why Israel is so innovative, many reacted by saying, "It's simp
—Jews are smart, so it's no surprise that Israel is innovative." But pinning Israel's success on
stereotype obscures more than it reveals.

For starters, the idea of a unitary Jewishness—whether genetic or cultural—would seem to hav
little applicability to a nation that, though small, is among the most heterogeneous in the worl
Israel's tiny population is made up of some seventy different nationalities. A Jewish refugee from Ira
and one from Poland or Ethiopia did not share a language, education, culture, or history—at least n
for the two previous millennia. As Irish economist David McWilliams explains, "Israel is quite th
opposite of a uni-dimensional, Jewish country. . . . It is a monotheistic melting pot of a diaspora th
brought back with it the culture, language and customs of the four corners of the earth."[18]

While a common prayer book and a shared legacy of persecution count for something, it was f
from clear that this disparate group could form a functioning country at all, let alone one that wou
excel at—of all things—teamwork and innovation.

Indeed, Israel's secret seems to lie in something more than just the talent of individuals. The
are lots of places with talented people, certainly with many times the number of engineers that Isra
has to offer. Singaporean students, for example, lead the world in science and mathematics test score
Multinationals have set up shop in places like India and Ireland, too. "But we don't set up our missio
critical work in those countries," an American executive from eBay told us. "Google, Cisc
Microsoft, Intel, eBay . . . the list goes on. The best-kept secret is that we all live and die by the wo
of our Israeli teams. It's much more than just outsourcing call centers to India or setting up
services in Ireland. What we do in Israel is unlike what we do anywhere else in the world."[19]

Another commonly cited factor in Israel's success is the country's military and defense industr
which has produced successful spin-off companies. This is part of the answer, but it does not expla
why other countries that have conscription and large militaries do not see a similar impact on the
private sectors. Pointing to the military just shifts the question: What is it about the Israeli milita

that seems to foster entrepreneurship? And even with the influence of the military, why is it th defense, counterterrorism, and homeland security companies today represent less than 5 percent Israel's gross domestic product?

The answer, we contend, must be broader and deeper. It must lie in the stories of individu entrepreneurs like Shai Agassi, which are emblematic of the state itself. As we will show, it is a sto not just of talent but of tenacity, of insatiable questioning of authority, of determined informalit combined with a unique attitude toward failure, teamwork, mission, risk, and cross-disciplina creativity. Israel is replete with such stories. But Israelis themselves have been too busy building the start-ups to step back and try to stitch together how it happened and what others—governments, lar companies, and start-up entrepreneurs—can learn from their experience.

It would be hard to imagine a time when understanding the story of Israel's economic mirac could be more relevant. While the United States continues to be rated the world's most competitiv economy, there is a widespread sense that something fundamental has gone wrong.

Even before the global financial crisis that began in 2008, observers of the innovation race we sounding alarms. "India and China are a tsunami about to overwhelm us," predicted Stanford Researc Institute's Curtis Carlson. He forecasts that America's information technology, service, and medica devices industries are about to be lost, costing "millions of jobs . . . like in the 1980s when th Japanese surged ahead." The only way out, says Carlson, is "to learn the tools of innovation" and for entirely new, knowledge-based industries in energy, biotechnology, and other science-based sectors.[2

"We are rapidly becoming the fat, complacent Detroit of nations," says former Harvard Busines School professor John Kao. "We are . . . milking aging cows on the verge of going dry . . . [and] losin our collective sense of purpose along with our fire, ambition, and determination to achieve."[21]

The economic downturn has only sharpened the focus on innovation. The financial crisis, aft all, was triggered by the collapse of real estate prices, which had been inflated by reckless ban lending and cheap credit. In other words, global prosperity had rested on a speculative bubble, not o the productivity increases that economists agree are the foundation of sustainable economic growth.

According to the pioneering work of Nobel Prize winner Robert Solow, technological innovatio is the ultimate source of productivity and growth.[22] It's the only proven way for economies consistently get ahead—especially innovation born by start-up companies. Recent Census Bureau da show that most of the net employment gains in the United States between 1980 and 2005 came fro firms younger than five years old. Without start-ups, the average annual net employment growth ra would actually have been negative. Economist Carl Schramm, president of the Kauffman Foundatio which analyzes entrepreneurial economics, told us that "for the United States to survive and continu its economic leadership in the world, we must see entrepreneurship as our central comparativ advantage. Nothing else can give us the necessary leverage."[23]

It is true that there are many models of entrepreneurship, including microentrepreneurship (th launching of household businesses) and the establishment of small companies that fill a niche an never grow beyond it. But Israel specializes in high-growth entrepreneurship—start-ups that wind u transforming entire global industries. High-growth entrepreneurship is distinct in that it us specialized talent—from engineers and scientists to business managers and marketers—to commercialize a radically innovative idea.

This is not to suggest that Israelis are immune from the universally high failure rate of start-up But Israeli culture and regulations reflect a unique attitude to failure, one that has managed repeatedly bring failed entrepreneurs back into the system to constructively use their experience to t again, rather than leave them permanently stigmatized and marginalized.

As a recent report by the Monitor Group, a global management consulting firm, described

“When [entrepreneurs] succeed, they revolutionize markets. When they fail, they still [kee
incumbents under constant competitive pressure and thus stimulate progress.” And the Monitor stud
shows that entrepreneurship is the main engine for economies to “evolve and regenerate.”[24]

The question has become, as a *BusinessWeek* cover put it, “Can America Invent Its Way Back?”
The magazine observed that “beneath the gloom, economists and business leaders across the politic
spectrum are slowly coming to an agreement: Innovation is the best—and maybe the only—way th
U.S. can get out of its economic hole.”

In a world seeking the key to innovation, Israel is a natural place to look. The West need
innovation; Israel’s got it. Understanding where this entrepreneurial energy comes from, where it
going, how to sustain it, and how other countries can learn from the quintessential start-up nation is
critical task for our times.

PART I

The Little Nation That Could

CHAPTER 1

Persistence

Four guys are standing on a street corner . . .
an American, a Russian, a Chinese man, and an Israeli. . . .
A reporter comes up to the group and says to them:
“Excuse me. . . . What’s your opinion on the meat shortage?”
The American says: What’s a shortage?
The Russian says: What’s meat?
The Chinese man says: What’s an opinion?
The Israeli says: What’s “Excuse me”?

—Mike Leigh, *Two Thousand Years*

Scott Thompson looked at his watch.[1] He was running behind. He had a long list of to-dos to complete by the end the week, and it was already Thursday. Thompson is a busy guy. As president and former chie technology officer of PayPal, the largest Internet payment system in the world, he runs the Web alternative to checks and credit cards. But he’d promised to give twenty minutes to a kid who claime to have a solution to the problem of online payment scams, credit card fraud, and electronic identi theft.

Shvat Shaked did not have the brashness of an entrepreneur, which was just as well, since mo start-ups, Thompson knew, didn’t go anywhere. He did not look like he had the moxie of even typical PayPal junior engineer. But Thompson wasn’t going to say no to this meeting, not whe Benchmark Capital had requested it.

Benchmark had made a seed investment in eBay, back when it was being run out of the founder apartment as a quirky exchange site for collectible Pez dispensers. Today, eBay is an $18 billio public company with sixteen thousand employees around the world. It’s also PayPal’s pare company. Benchmark was considering an investment in Shaked’s company, Israel-based Frau Sciences. To help with due diligence, the Benchmark partners asked Thompson, who knew a thing two about e-fraud, to check Shaked out.

“So what’s your model, Shvat?” Thompson asked, eager to get the meeting over with. Shiftin around a bit like someone who hadn’t quite perfected his one-minute “elevator pitch,” Shaked bega

quietly: “Our idea is simple. We believe that the world is divided between good people and ba
people, and the trick to beating fraud is to distinguish between them on the Web.”

Thompson suppressed his frustration. This was too much, even as a favor to Benchmark. Befo
PayPal, Thompson had been a top executive at credit card giant Visa, an even bigger company th
was no less obsessed with combating fraud. A large part of the team at most credit card companies ar
online vendors is devoted to vetting new customers and fighting fraud and identity theft, becau
that’s where profit margins can be largely determined and where customer trust is built or lost.

Visa and the banks it partnered with together had tens of thousands of people working to be
fraud. PayPal had two thousand, including some fifty of their best PhD engineers, trying to stay ahea
of the crooks. And this kid was talking about “good guys and bad guys,” as if he were the first
discover the problem.

“Sounds good,” Thompson said, not without restraint. “How do you do that?”

“Good people leave traces of themselves on the Internet—digital footprints—because they hav
nothing to hide,” Shvat continued in his accented English. “Bad people don’t, because they try to hi
themselves. All we do is look for footprints. If you can find them, you can minimize risk to a
acceptable level and underwrite it. It really is that simple.”

Thompson was beginning to think that this guy with the strange name had flown in not from
different country but rather a different planet. Didn’t he know that fighting fraud is a painstakin
process of checking backgrounds, wading through credit histories, building sophisticated algorithm
to determine trustworthiness? You wouldn’t walk into NASA and say, “Why build all those fanc
spaceships when all you need is a slingshot?”

Still, out of respect for Benchmark, Thompson thought he’d indulge Shaked for a few mo
minutes. “So where did you learn how to do this?” he asked.

“Hunting down terrorists,” Shaked said matter-of-factly. His unit in the army had been taske
with helping to catch terrorists by tracking their online activities. Terrorists move money through th
Web with fictitious identities. Shvat’s job was to find them online.

Thompson had heard enough from this “terrorist hunter,” too much even, but he had a simple wa
out. “Have you tried this at all?” he asked.

“Yes,” Shaked said with quiet self-assurance. “We’ve tried it on thousands of transactions, an
we were right about all of them but four.”

Yeah, right, Thompson thought to himself. But he couldn’t help becoming a bit more curiou
How long did that take? he asked.

Shaked said his company had analyzed forty thousand transactions over five years, since i
founding.

“Okay, so here’s what we’re going to do,” Thompson said, and he proposed that he give Frau
Sciences one hundred thousand PayPal transactions to analyze. These were consumer transactio
PayPal had already processed. PayPal would have to scrub some of the personal data for legal privac
reasons, which would make Shvat’s job more difficult. “But see what you can do,” Thompson offere
“and get back to us. We’ll compare your results with ours.”

Since it had taken Shvat’s start-up five years to go through their first forty thousand transaction
Thompson figured he wouldn’t be seeing the kid again anytime soon. But he wasn’t asking anythi
unfair. This was the sort of scaling necessary to determine whether his bizarre-sounding system wa
worth anything in the real world.

The forty thousand transactions Fraud Sciences had previously processed had been don
manually. Shaked knew that to meet PayPal’s challenge he would have to automate his system i
order to handle the volume, do so without compromising reliability, and crunch the transactions i
record time. This would mean taking the system he’d tested over five years and turning it upsi

down, quickly.

Thompson gave the transaction data to Shvat on a Thursday. "I figured I was off the hook wi Benchmark," he recalled. "We'd never hear from Shvat again. Or at least not for months." So he wa surprised when he received an e-mail from Israel on Sunday. It said, "We're done."

Thompson didn't believe it. First thing Monday morning, he handed Fraud Sciences' work ov to his team of PhDs for analysis; it took them a week to match the results up against PayPal's. But b Wednesday, Thompson's engineers were amazed at what they had seen so far. Shaked and his sma team produced more accurate results than PayPal had, in a shorter amount of time, and wi incomplete data. The difference was particularly pronounced on the transactions that had given PayP the most trouble—on these, Fraud Sciences had performed 17 percent better. This was the category customer applicants, Thompson told us, that PayPal initially rejected. But in light of what PayPal no knows from monitoring the rejected customers' more recent credit reports, Thompson said, thos rejections were a mistake: "They are good customers. We should never have rejected them. The slipped through our system. But how did they *not* slip through Shaked's system?"

Thompson realized that he was looking at a truly original tool against fraud. With even less da than PayPal had, Fraud Sciences was able to more accurately predict who would turn out to be a goo customer and who would not. "I was sitting here, dumbfounded," Thompson recalled. "I didn't get We're the best in the business at risk management. How is it that this fifty-five-person company fro Israel, with a crackpot theory about 'good guys' and 'bad guys,' managed to beat us?" Thompso estimated that Fraud Sciences was five years ahead of PayPal in the effectiveness of its system. H previous company, Visa, would never have been able to come up with such thinking, even if given te or fifteen years to work on it.

Thompson knew what he had to tell Benchmark: PayPal could not afford to risk letting i competitors get hold of Fraud Sci-ences' breakthrough technology. This was not a compan Benchmark should invest in; PayPal needed to acquire the company. Immediately.

Thompson went to eBay's CEO, Meg Whitman, to bring her into the loop. "I told Scott that it w impossible," Whitman related. "We're the market leader. Where on earth did this tiny little compan come from?" Thompson and his team of PhDs walked her through the results. She was astounded.

Now Thompson and Whitman had a truly unexpected problem on their hands. What could the tell Shvat? If Thompson told this start-up's CEO that he had handily beaten the industry leader, th start-up's team would realize they were sitting on something invaluable. Thompson knew that PayP had to buy Fraud Sciences, but how could he tell Shvat the test results without jacking up th company's price and negotiating position?

So he stalled. He responded to Shaked's anxious e-mails by saying PayPal needed more time fo analysis. Finally, he said he would share the results in person the next time the Fraud Sciences tea was in San Jose, hoping to buy more time. Within a day or two, Shaked was on Thompson's doorstep

What Thompson did not know, however, was that the Fraud Sciences founders—Shaked and Sa Wilf, who served together in Israel's elite army intelligence unit, called 8200—were not interested selling their company to PayPal. They just wanted Thompson's blessing as they proceeded down checklist of due diligence requirements for Benchmark Capital.

Thompson went back to Meg: "We need to make a decision. They're here." She gave him the go ahead: "Let's buy it." After some valuation work, they offered $79 million. Shaked declined. Th Fraud Sciences board, which included the Israeli venture firm BRM Capital, believed the compan was worth at least $200 million.

Eli Barkat, one of the founding partners of BRM, explained to us his theory behind th company's future value: "The first generation of technology security was protecting against a viru invading your PC. The second generation was building a firewall against hackers." Barkat kne