THE INTERNET OF ELSEWHERE

The Emergent Effects of a Wired World

CYRUS FARIVAR

Foreword by Vinton Cerf

The Internet of Elsewhere

The Internet of Elsewhere

The Emergent Effects of a Wired World

CYRUS FARIVAR

FOREWORD BY VINTON G. CERF

RUTGERS UNIVERSITY PRESS

NEW BRUNSWICK, NEW JERSEY, AND LONDON

LIBRARY OF CONGRESS CATALOGING-IN-PUBLICATION DATA

Farivar, Cyrus.

The internet of elsewhere : the emergent effects of a wired world / Cyrus Farivar ; with a foreword by Vinton G. Cerf.

p. cm

Includes bibliographical references and index.

ISBN 978–0–8135–4962–0 (hardcover : alk. paper)

1. Internet—Social aspects—Developing countries—Case studies.
2. Internet—Political aspects—Developing countries—Case studies.
3. Information technology—Social aspects—Developing countries—Case studies.
4. Information technology—Political aspects—Developing countries—Case studies.
5. Internet—South Korea. 6. Internet—Senegal. 7. Internet—Estonia.
8. Internet—Iran. I. Title.

HM851.F35 2011

303.48′3309—dc22 2010024091

A British Cataloging-in-Publication record for this book is available from the British Library.

Visit our Web site: http://rutgerspress.rutgers.edu

Manufactured in the United States of America

To my parents, Sydney and Mehrdad, who showed me the way,
and to Rebecca, who kept me going

CONTENTS

FOREWORD

VINTON G. CERF

I have just finished reading this book. It is an amazing amalgam of history, despair, triumph of the human spirit, and close-up glimpses of the complex fabric of social, political, and technological revolution. Written through a framework of countries where change has come despite all odds, it takes the reader into cultures that have absorbed, adapted, and altered the Internet fabric to fit their unique contexts.

I had the pleasure of meeting the author of this book, Cyrus Farivar, at a conference called LIFT, in 2009. I enjoyed our give and take in an interview, but until I read this book I did not fully appreciate the depth of passion that the Internet and its story in these countries had stirred in his soul.

I was reminded of another book, written in 1992 by Carl Malamud, titled *Exploring the Internet.* Malamud was already blazing historical trails in an Internet that was just making its way onto the public's radar. It was the year when I first heard people apologizing for not having an e-mail address on their business cards. Considering that networked e-mail had been invented in 1971, this was a long, twenty-year gestation! The World Wide Web, although conceived and first made concrete at CERN on Christmas Day, 1990, had not yet emerged to public consciousness. But Malamud's tales chronicled a global awakening.

Farivar has done something similar in this book, but also draws our attention to the courage it has taken in some places to pursue access to and development of Internet infrastructure in regimes where freedom of expression is the exception, not the rule. The old adage: "Where there's a will, there's a way," seems eminently appropriate to describe much of what is found in these stories.

While the Internet could not have become what it is today without the concerted efforts of millions, it is still remarkable that the success stories in this book revolve around one or perhaps a few people who dedicate themselves to planting and growing the Internet's seeds in sometimes resistant soil. These stories reinforce the notion that sometimes one person can make an enormous difference. It is a reminder that patience and persistence are often the only ways to achieve long-term goals.

In reading about the Internet in Estonia, I was impressed by the range and depth of applications developed there, especially regarding government services and electronic voting. But I was even more surprised to realize that all of this has happened in less than twenty years, since the country emerged from the Soviet Union's iron cloak in 1991. That these online applications have proven not only achievable but also sustainable gives sustenance to those with similar aspirations to change the state of their societies and to make them more open and transparent.

Economics is playing a key role in the continued spread of Internet access. Estimates of Internet use now hover just below 2 billion users, worldwide. Surprisingly, about 400 million of these users are in the People's Republic of China! There are an estimated 4.5 billion mobiles in use, perhaps 15–20 percent of which have some kind of Internet access. Device costs are coming down. Means of access include 2G, 3G, 4G, LTE, WiFi, fiber to the home, digital subscriber loops, broadband cable, WiMax, conventional forms of Ethernet, 6Lowpan, and dial-up modems, among others. College campuses and Internet cafés are often the first places that provide Internet access, although the smartphone/mobile is clearly taking the lead in countries where Internet access is still nascent.

It is hard to predict what the consequences of an increasingly networked planet will be, but one thing is certain: our ability to share information, to find information, and to use information can only be enhanced by the proliferation of Internet and related technology throughout our global society. Our descendants in the twenty-second century will read books like this one and wonder at the primitive "Estonia-age" uses of the Internet. But for us, it's as if the invention of fire was not so long ago and the wheel is yet to come.

ACKNOWLEDGMENTS

This book is dedicated to my parents, Sydney and Mehrdad Farivar, who created ample opportunities for me to explore my own elsewhere. My mother, who sadly passed away in February 2010, helped me get online for the first time in the 1990s. This book would not have been possible without both of them. The book is also dedicated to my loving wife, Rebecca, who endured my extended reporting trips abroad and many late-night Skype calls to foreign lands, and who ultimately believed in me. I cannot thank her enough.

Sam Freedman, a true *mensch,* pushed me from the very beginning, when this book was just a sketch of an idea for his book writing class at the Columbia University Graduate School of Journalism. I am forever indebted to him and his mentorship, scholarship, and editing skills. I am lucky to consider him a colleague and friend.

My editors, Marlie Wasserman and Doreen Valentine, saw this book through its many iterations, helped shape it, and shepherded me through the process. Thanks also to Noah Breuer for providing cover art for much less than what he deserves.

A major shout out goes out to three good friends who edited the manuscript in its earlier stages: John Borland, Joe Lewandowski, and David Sasaki.

Big ups to family members who have always shaped my world-view: Alex Farivar, Zari Farivar, John Hadsell, Virginia Hadsell, Heidi Hadsell, Martin do Nascimento, and Nena do Nascimento.

Un grand merci also for the friendship and support of David Boyk, Rachel Rosmarin, Dallas Bluth, Michele Jonas, Joe Lewandowski, Angie Lewandowski, Monica Tirado, Malcolm Knapp, Julie Pinkerton, and Zach Pinkerton.

Also, *muchas gracias* to Alan Wiig for his never-ending enthusiasm for this project and for suggesting the title and Bhu Muhler for his inspirational photograph of an Internet café that I have kept on my desk for many years.

I am also grateful to my Columbia classmates and journalism colleagues, most notably Denise Carson, who commiserated with me over the minutiae of book writing. *Medasi* and *спасибо* to Ethan Zuckerman and Evgeny Morozov, respectively, for always challenging my thinking on global Internet issues.

This book also would not exist without its four major characters: Chon Kilnam, Amadou Top, Veljo Haamer, and Omid Memarian. Thank you for allowing me to spend so much time with you and to tell your stories.

IN THE SOUTH KOREA SECTION, 감사합니다 to Jim Larson, Park Huynje, Chris Chung, Bob Kahn, Florence Chee, Hanna Cho, Ted Peng, Yong Sam Koh, Hyon Oh Yoo, Matthew Weigand, Jin Ho Hur, Vint Cerf, Kwang Oh Suk, Park Seung-Kyu, Jung Chul, Paul Lee, Sunay Lee, Lee Yong-Teh, S. H. Kyong, Jake Song, Kim Yoon, Lee Dongman, Huhh Jun-Sok, Daniel Lee, Je Hun-Ho, Lee Yeon-Yeol, Jean Min, Mitchell Hong, M. K. Kang, Cheon Yeong-Cheoul, Kim Hyesoo, Carl Seaholm, Paul Chong, and Don Sutherland.

I traveled to report in South Korea in April 2007 and will be forever indebted to the CouchSurfers and new friends who opened up their homes to me: Karla Moore (thanks especially for your spare mobile phone!), Loren Everly, Rachel Stotts and Nathan Lucas, Jennifer Lee, Aaron Tassano and Shin Soo-Jin, and also to Gary Rector for a truly unforgettable evening.

IN THE SENEGAL SECTION, *jëre-jëf waaye* to Jim Delehanty, Olivier Sagna, Blaise Rodriguez, Daniel Annerose, Bamba Baba, Bob Kahn, Brian King, Cheikh Mdiouck, Daouda Mbaye, Erin Soto, Fatoumata Sow, George Sadowsky, Ibrahima Basse, Ibrahima Yock, Janine Firpo, Lisa Goldman, Emily Renard, Sylvia Lankford, Mohammed Tidiane Seck, Jeynaba Ba, John Mack, John Stamm, Judith Payne, Larry Landweber, Mamadou Gaye, Matt Berg, Max Gaye, Madame Diagne, Ousmane Diop, Ousmane Mbaye, Russell Southwood, Scott Pennington, Abdoul Ba, Alain Just Coly, Alioune Faye, Tiffany Lee Brown, Fatimata Sèye Sylla, Ben Akoh, Babacar Diop, Steve Huter, Cherif Sarr, Jean Pouly, Anne Koplinka-Loehr, Marian Zeitlin, and Alex Corenthin.

I traveled to Senegal in January 2007 and for three weeks experienced real Senegalese *teranga* courtesy of Fatou Lô Rochefort and Dominique "Issa" Rochefort.

IN THE ESTONIA SECTION, *aitäh* to Andrus Aaslaid, Ivar Tallo, Kristijan Kask, Siim Teller, Mart Thomson, Mihkel Tammet, Riihon Urksa, Allan Martinson, Rain Rannu, Madis Tiik, Sten Soosaar, Arne Kaasik, Oliver Wihler, Andrus Viirg, Raul Volter, Jacob Farkas, Liivi Kruus, Kris Haamer, Heiki Kübbar, Mart Laar, Madis Taupere, Enn Tyugu, Rainer Nõlvak, Meelis Kitsing, Andres Aarma, Tarvi Martens, Thad Hall, Sten Tamkivi, Taavet Hinrikus, Priit Alamäe, Andrew Vskimeister, Gunnar Kobin, Juhan Parts, Margus Kurm, Silver Meikar, General Johannes Kert, Kenneth Geers, Lauri Almann, Hillar Aarelaid, Heli Tirmaa-Klaar, Raul Allikivi, Anto Veldre, Ago Väärsi, Riina Reeder, Martin Jasko, Linnar Viik, Arvo Ott, Edmund Laugasson, Dawn Nafus, Rica Semjonova, Martin Leiger, Jaak Aaviksoo, Luukas Ilves, and President Toomas Hendrik Ilves.

Tuhat tänu for the couch, endless nights of pool, beer, hospitality, saunas, and camaraderie to Ivo Kivinurk, Vaino Haamer, Kris Haamer, and especially Veljo Haamer.

Tänan for the Estonian translation, Maria Visnapuu, and to Liene Lapevska, *paldies* for the drinks in Riga. Finally, *vielen dank* for the couch in Berlin, John Borland and Aimee Male.

IN THE IRAN SECTION, خیلی متشکرم to Aaron Scullion, Abbas Milani, Afshin Memarian, Afshin Molavi, Ali Shokoufandeh, Behdad Esfabod, Borzou Daragahi, Bozorgmehr Sharafedin, Dariush Zahedi, Hamid Tehrani, Farnaz Ghazizadeh, Hadi Ghaemi, Hanif Mazroi, John Kelly, Jonathan Lundqvist, Leila Memarian, Mahan Abedin, Mark Glaser, Massoud Safiri, Mohammad Ali Abtahi, Nasrin Sotoodeh, Nima Mina, Parastoo Dokouhaki, Payman Arabshahi, Ramin Jahanbegloo, Roozbeh Mirebrahimi, Salman Jariri, Shahram Rafizadeh, Shahram Sharif, Shideh Bahmanyar, Siavash Shahshahani, Sina Motalebi, Sina Tabesh, Steve Goldstein, Touran Memarian, Afshin Memarian, Sanam Dolatshahi, Hossein Derakhshan, Hamed Derakhshan, Ali Reza Eshraghi, Farhad Ardalan, Babak Siavoshy, and Austin Heap.

Mersi to Rebekah Kouy-Ghadosh for the Persian translation and your unwavering friendship. Finally, an extra special *ma'am noon* goes out to my cousin and Iran analyst extraordinaire, Karim Sadjadpour, for introducing me to Omid Memarian.

The Internet of Elsewhere

Introduction

Tallinn, Estonia

June 19, 2009

One week after the Iranian presidential election I found myself sitting alone at my friend Veljo Haamer's desk. I scoured the Internet for information about Iran. The country had been essentially at a standstill and the foreign media expelled as the government clamped down on what little free speech remained. Occasionally, I sipped from my Estonian lager and stared out his second-story window. I watched the hours-long summer twilight burning through Haamer's curtainless east-facing windows. On that night, I was alone, as Haamer had gone to visit his father in the eastern countryside, near the Russian border.

Veljo Haamer is Estonia's well-known WiFi evangelist and had become a good friend ever since my first trip to Estonia in March 2005. On each of my next four trips to Tallinn, I'd slept on his couch. The studio apartment wasn't very big at all. In fact, it was just a single room that'd been divided into roughly four quadrants through the creative use of furniture. One housed his bed (an inflatable air mattress), his Apple AirPort Extreme WiFi router, his desk, and a bookcase. Towering above his workspace along a wide bookcase was a mish-mash of wireless cards, WiFi-related books, magazines, old ticket stubs, and flyers, and his own WiFi.ee stickers strewn about in a very haphazard fashion. Old conference badges flopped all over random business cards cozying up to back issues of *Wired.* On the other side of this bookcase was the tiny second quadrant, with only a rarely used television and a dusty couch.

A stand-alone closet served as a barrier between the couch and the kitchen, creating the third quadrant, which had barely enough room for one person to cook at a time. On this trip, Haamer's fridge was finally stocked with more than just beer, sausage, butter, and bread—the first time I'd seen anything of substance

in it since I'd known him. He admitted to me that the previous six months had been especially difficult for him. His freelance WiFi consulting work had all but dried up. That meant not eating or drinking out nearly as much as before, and not driving at all. Haamer was too proud to go on public assistance, saying that he should "earn incomings by my own hands."[1] The final quadrant, the entryway and bathroom, had a shower stall that was so close to the kitchen sink that anyone taking a shower could easily reach for the dish soap above the sink just by sticking a hand out of the shower door. The toilet was the only other room in the apartment with a separate door, and even then it was just big enough to hold a toilet, a shelf, and a poster of a German band, Rammstein.

Haamer's apartment is one of eight units in a small building at the end of Leigeri Street in Kalamaja, one of the Estonian capital's oldest suburbs. Local lore has it that Kalamaja dates back to the fourteenth century, when it was a mere fishing village. Today, it's a charming neighborhood filled with small wooden houses from the 1920s. It's one of the few areas in Tallinn that was not damaged during the Soviet occupation of Estonia, which lasted from 1945 until 1991. Although it's just a short walk from Tallinn's train station, and a little farther to the Estonian Parliament, it feels like a world away from the increasingly expensive, fast-paced, cosmopolitan, English-speaking city center where many foreigners spend much of their time.

Officially, I had been in Estonia to speak at the first NATO Cooperative Cyber Defence Centre of Excellence conference on cyberwarfare and cybersecurity. But at that late hour, I was working on a story for Public Radio International's *The World* about how Silicon Valley companies, including Apple, Google, and Facebook, had just released new Persian-language capabilities in the wake of the controversial Iranian election. Enthroned in Haamer's chair, I used Skype to place free calls over the Internet to sources in California. Skype had been created just a few years earlier, only a few kilometers from where I sat in Kalamaja. Here I was bringing together California and Iran through Estonian engineering. In just a few short hours, I conducted interviews, wrote, edited, and recorded my entire piece for a nationally syndicated American radio program. While I made a late dinner in the midnight twilight, I listened to the show live over the Internet. Less than a decade earlier, this would have been impossible. These were just the latest iterations of new technology tools that have become vital to Iranian dissidents, given that all independent foreign media had essentially been kicked out of the country, and that free domestic media did not exist.

Weeks before the election, I had reported on the increased use of social media, including Twitter, Facebook, and FriendFeed by all major candidates in the Iranian presidential election, reformist and conservative alike. Even President Mahmoud Ahmadinejad himself had started a blog back in 2006. But in an environment with almost no nongovernmental voices, and a crackdown on the existing foreign satellite broadcasts, reformists and protestors had no choice

but to turn to the Internet, to send e-mails, photos, and video. One Persian-language satellite television channel based in southern California was said to have sent thousands of miniature pen cameras to Iran, which could easily be connected to a computer to upload their photos to the Internet. Reformist candidates, most notably Mir-Hossein Mousavi, the former prime minister, used his Facebook page on June 13 to call for supporters in Tehran to go to their rooftops and shout the normally religious chant "Allah wa Akbar!" (God is Great!), thereby co-opting it from the hard-liner religious conservatives. He wrote: "Tonight all go to the roofs and let the chant, 'Allah Akbar' fill the air in Tehran. Internet and cell phones are completely offline. Use landlines as much as you can and spread the news."[2]

Later, messages in English and Persian spread quickly across Twitter, with a small handful of users in Iran sending out as much information as possible. Sina Tabesh, a twenty-three-year-old Internet user in North Tehran, tweeted in English on June 13, 2009: "Northern part of Tehran is on fire, people attacked a gas station to explode it." Others were spreading information of arrests of dissidents as the government disseminated it: on June 13, 2009, another blogger, Somayeh Tohidlou, wrote on her FriendFeed page in Persian: "Latest News: Doctor Mohsen Mirdamadi—Ms. Zahra Soon Mirdamadi wife—Saeed Shariati—Zohreh Aghajari and Behzad Nabavi, Abdollah Ramezanzadeh are confirmed arrested."[3]

While I waited for my piece to be edited and mixed, I ran Twitter searches, looking for the latest news and information about Iran, checking messages tagged *#iranelection,* a searchable code word to find more information about the Iranian election. Many journalists, myself included, felt overwhelmed with the sheer volume of Twitter messages pertaining to Iran. The torrent of messages providing links to photos and videos, watching them as they came in—particularly when more than usual claimed to be coming from within Iran—was unlike anything I'd ever seen. The best and most newsworthy messages, I forwarded on to friends and sent out on my own Twitter account.

Some messages included raw emotions, like this one from Parastoo Dokouhaki, a young feminist blogger in Tehran, who wrote in English: "[I] feel like somebody's foot is on my neck, preventing me to breathe. I can do almost nothing online. Suppression. Want to cry. #IranElection." Others expressed frustration at the seeming lack of help by foreign tech companies, like Google. As Babak Mehrabani wrote in Persian: "A few days ago [companies made] any excuse not to service the Iranians, now special services for Iranians are starting? Example: Google Translate."[4]

THE MORE I READ THESE POSTS, the more I felt like I was part of something bigger than myself. With information flowing faster than I could read it, I got swept up in the fervor, as did many others across the globe. But with my own Iranian-American heritage, and my extended family in Iran, how could I not try to

understand the play-by-play of actions and analysis that were coming out about Iran? This time, though, many non-Iranians and others who had no previous connection to Iran somehow suddenly became captivated as well. Many users changed their Twitter avatar color to green, in solidarity with the opposition campaign of Mir-Hossein Mousavi. The former prime minister's campaign used the traditionally Islamic color of green as a way to co-opt the religiosity of his conservative opponent, President Mahmoud Ahmadinejad. I also noticed that many Twitter users had changed their virtual location to Tehran, hoping to confuse Iran's Internet police—the idea being that if everyone is in Tehran, then no one is.[5] There's no evidence that this strategy worked, but that didn't stop many people from trying to help, even in some small way.

Indeed, later research by the Web Ecology Project, an academic interdisciplinary research group based in Boston, confirmed that between June 7, 2009, and June 26, 2009, there were over 2 million messages on Twitter about the election in Iran. While it was easy to think that these Twitter messages were part of a mass movement, the top 10 percent of users produced two-thirds of the Iran-related tweets, and one-quarter of all tweets about Iran were retweets, or rebroadcasts, of someone else's messages.[6] This research confirms Twitter's role as more of an amplification and dissemination tool. It was not primarily used as a social organization tool from within Iran.

However, while relatively few Iranians were using Twitter prior to the election, nearly all those who had a mobile phone—roughly two out of every three Iranians—were familiar with text messages. As is the case in many parts of the world, text messages are the cheapest and most effective way to communicate quick pieces of information in Iran. The Islamic Republic clearly knew that mobile phones would also be used as a way to socially mobilize dissidents, and blocked all text messages on all three carriers from Election Day until July 1, 2009.[7]

EARLIER THAT WEEK, on June 15, 2009, the U.S. Department of State realized the potential power that Twitter could have in distributing information out of Iran. A State Department official reached out to a Twitter founder and suggested that the company reschedule its planned maintenance time—during which the entire service would be shut down—so that it would be more conducive to users in Iran, instead of American users. Twitter complied, noting at the time that the service "is currently playing as an important communication tool in Iran."[8]

Even before the State Department took notice of Twitter, there were other forms of protest that many reformist sympathizers abroad began to take into their own hands. These activists targeted Iranian government websites, including that of President Mahmoud Ahmadinejad, as a way to show disapproval. This tactic, known as a "denial of service" attack, uses false traffic to overwhelm a web server, causing it to crash. It would be as if a highway could suddenly get flooded with so many cars that no car could possibly move.

Although I didn't know it at the time, tech-savvy activists like Austin Heap, a twenty-five-year-old "cyberactivist" in San Francisco, wrote scripts and created new sets of instructions that specifically targeted Iranian government websites. Non-techies discovered existing tools, like PageReboot, designed for commercial uses like monitoring auctions on eBay, and configured them to automatically reload particular sites every few seconds. While some Islamic Republic sites did go down at various points in the immediate aftermath of the election, it's hard to say how effective the calls for such cyberattacks were. Nonetheless, countless anonymous Internet users worldwide felt compelled to show their defiance against the Islamic Republic.

Other online pundits provided a more sobering analysis of the effectiveness of such attacks, noting that because Iran had throttled down the overall speed of its domestic Internet by 60 percent (from five gigabits per second before the election to two), the cyberattacks made it that much more difficult for pro-opposition websites to get their message out. James Cowie, the CEO of Renesys, a bandwidth analysis firm, put it this way in an e-mail to technology journalist Evgeny Morozov: For all the well-intentioned efforts to attack government websites in Iran, dissidents and their supporters may have been in fact just shooting themselves in the foot. He concluded that, technically speaking, "If you attack a pro-government site, you are almost certainly also stealing bandwidth from pro-opposition sites."[9]

The Islamic Republic and its supporters began reacting as well. Just as reformists and other dissidents were active on Twitter, so too were voices of the regime, including the supreme leader, Ayatollah Ali Khamenei. A Twitter account in his name—@khamenei_ir—linked back to his official website. There were also reports that government agents or supporters were using Twitter to spread false information, such as sending protestors to nonexistent protests.[10]

These actions by the government and/or their sympathizers mimicked the behavior of a cadre of reformist bloggers who had been active for years, writing from both within and outside of Iran about the failings, abuses, and crimes conducted by the Islamic Republic. The government, in turn, responded with a clampdown, and before the June election it announced that it would be launching an online army of 10,000 *Basij*—a morality police—who would act as pro-regime bloggers.[11]

Further, in the months leading up to the Iranian presidential election of June 2009, a government-run site, gerdab.ir ("whirlpool" or "vortex"), appeared and after the election posted photographs of protestors, asking the public to identify them.[12] If any government sympathizers have come forward with "useful" information, the Iranian government hasn't said so. This battle has continued on in subsequent months, with such headlines on the gerdab.ir website as "Iranian Revolutionary Guards ready to fight cyber and Internet war" (September 7, 2009) and "An Internet battle report in the defeated velvet coup" (October 1, 2009).

Clearly, the Islamic Republic is trying to make an online show of force—to underscore the point that it is capable in engaging online dissidents in its own way.

MEANWHILE, Austin Heap moved on from making offensive tools against the Islamic Republic to publishing a list of open proxy servers, or ways that Internet users in Iran could filter their traffic through computers outside of the country, thereby circumventing the government filtering system. But that effort was quickly overwhelmed as Iranians warned Heap that he was exposing those servers to attacks from Iran. Then he created a password-protected list of proxies and authored instructions to create more proxy servers.[13] That would let anyone online who was sympathetic to reformist Iranians create tools that would allow Internet traffic from Iran to be re-routed to computers outside the country, thereby establishing a crucial link between dissident Iranians and the outside world. Heap had no prior connection, professional nor personal, to Iran. But one of his core beliefs is that the Internet should be accessible to all. Period.

"Three weeks ago I was very happy playing Warcraft and I was following the Iran election," he told me in an interview in July 2009.[14] "But it wasn't until everything escalated there that I got involved." Heap felt that, given his technical skill and his belief in helping those being oppressed by their government online, it was his "responsibility" to help those less fortunate than himself.

Despite a quick outpouring of support from Iranians worldwide, the cyber authorities in Tehran were not having any of it. Within a few short days, Iranian authorities reacted to block all nonencrypted proxies—making the efforts of Heap, and everyone else who had followed his instructions, essentially useless. While Heap continued to probe the ability of Tehran's cyber authorities, other existing online anti-filtering tools began to spread around the Internet as well. One of the oldest (and arguably the best) of these tools was Tor. It was created in 2003 and was initially funded by the U.S. Naval Research Laboratory, and later by the Electronic Frontier Foundation. Today, its parent organization, The Tor Project, is an independent nonprofit based in Massachusetts.

Tor was initially designed as a web-anonymizing program, making it possible for people to surf the Internet as anonymously as possible. Tor's creators discovered that their software was also able to circumvent anti-filtering programs, even though it was not expressly designed to do so. As the most sophisticated of many anti-filtering applications, Tor strips away online identifying information as data passes through its network. That means it's significantly more difficult for anyone, including Iranian Internet authorities, to surveil online activity.

Tor relies on a network of thousands of users around the globe who have installed the free software on their computers and have them set up to act as relays. Once a computer is configured to act as a relay, other Tor users can pass

data through it. Each time a Tor user accesses the web, Tor passes the data through different, constantly changing relays as a way of masking the user's online trail.[15] Word of Tor and how to use it spread across the Iranian Internet very quickly.

"Before the election we were seeing about one to two hundred new users [from Iran] per day," said Andrew Lewman, executive director of The Tor Project, in an interview on July 2, 2009. "Right after the election and as the protests started, we started seeing that spike up into seven hundred to a thousand per day. Now we're up to about two thousand new users a day and around eight thousand connections sustained at any time, which is a huge, dramatic increase."[16]

Another anti-filtering tool that received a surge of attention was Psiphon. This application was released in early 2007 as a spin-off project from the Citizen Lab at the University of Toronto. However, less than ten days after the election, Psiphon's chief executive officer, Rafal Rohozinski, told the *Ottawa Citizen* that his colleagues were seeing one new Iranian user on the Psiphon network every minute. By the end of June, Rohozinski and his colleague Ron Deibert reported that more than fifteen thousand Iranians had used Psiphon. Again, Tehran took notice. As a result of Psiphon's popularity, Rohozinski and Deibert wrote, the Canadian envoy to Iran was "admonished" for helping Iranians get around government filters and access "immoral" content.[17]

One of Psiphon's attractive qualities is that it does not require any special configuration or the downloading of any additional software. In fact, since the Iranian election, Psiphon has released a special webpage in Persian for Iranians to sign up and use the service without having to download or install any software.[18]

"Psiphon is good for non-techies, easy to use types who don't want/know how to install software on their computer," wrote Nart Villeneuve, Psiphon's chief technology officer, in an e-mail.[19] "Tor is best for security, people at risk, those that require security."

WHILE SOME IRANIANS WERE TURNING to Tor and Psiphon for help, Austin Heap wasn't giving up. He tightened his circle and began working with a group of programmers and activists around Europe, Iran, and the United States, including Daniel Colascione, a similarly minded cyber activist living in New York State. On July 4, 2009, Heap announced the launch of Haystack ("Good luck finding that needle"), a new program specifically designed to target the Iranian Internet filtering system. Relying on information leaked from within Data Communications of Iran, Heap and others went to work on creating a computer program that they claimed could fool the Iranian Internet surveillance system.

Within days of the announcement, Heap hastily convened an evening meeting in a San Francisco high-rise with Colascione and a group of Iranian-American programmers, attorneys, and business leaders. By this time, I had

returned to California from Estonia and joined this group. There, Heap demonstrated Haystack for the first time and discussed the possibility of sneaking the program into Iran on smuggled USB sticks, digital camera memory cards, and other small, inconspicuous forms of media. Unlike Tor and Psiphon, the plan was not to make the application publicly available, but rather to have it be slowly distributed across a network of trusted users who would have corresponding numerical codes. These codes were put in place so that if Haystack fell into the wrong hands, then that portion of the network could be disabled without risking exposure of all users.

As the summer progressed, Heap continued to work on Haystack and got the attention of Washington, D.C., insiders. He met with aides, political analysts, and various congressional leaders, including Speaker of the House Nancy Pelosi, to discuss the possibility of getting financial and organizational support from the federal government for Haystack. Meanwhile, he continued improving the software. It wasn't until April 14, 2010, that Heap announced that Haystack had received a license for export to Iran from the U.S. Department of the Treasury. However, by September 2010, Haystack fell apart due to mistrust amongst its creators and the fact that a leaked copy of an earlier test version was exposed by security researchers to have serious flaws. Colascione and the board of directors immediately resigned, and the Haystack website stated that the organization had halted testing pending a security review.

BUT DESPITE THE UNPRECEDENTED LEVEL of attention given to Iran from both inside and outside the country, and Heap's advancing political connections, the status quo was preserved. Amid international outcry and violent repression at home, President Mahmoud Ahmadinejad was inaugurated for a second term on August 5, 2009. If there were any instance when an online community should be able to "fight the power," it should have been in the summer of 2009. After all, Iran is a country with a young, literate, and highly wired population. Given its history of political turbulence, coupled with the new social networking capabilities, online "netizens" might be expected to influence local politics in a meaningful way.

However, Iran has also illustrated its capability and willingness to limit Internet and text messaging access, to infiltrate online communities, and to intimidate dissidents. Indeed, there is evidence to suggest that the incumbent regime is being consolidated through military and political power, despite all of the international efforts from inside and outside of Iran to speak up online. But the Islamic Republic is constantly playing catch-up, as dissidents get their message out any way that they can. Less than two months after Ahmadinejad's swearing-in, on September 27, 2009, Mobin, a company entirely run by the Islamic Republic's Revolutionary Guards, bought a controlling stake (50 percent plus one share) in the Telecommunication Company of Iran. It paid $7.8 billion

for the privilege—the largest single deal in the history of the Tehran Stock Exchange.[20] This acquisition further suggests that the regime's desire to control online access and activities within the country. Despite this new level of control, blog posts, photos, and videos continue to trickle out of the country to this day.

In the late twentieth and early twenty-first centuries, conventional wisdom dictated a technological determinist view, that the mere presence of such a revolutionary telecommunications technology would upend the existing political, economic, and social regime. MIT's Nicholas Negroponte famously argued in 1995 that "being digital" could "flatten organizations, globalize society, decentralize control and help harmonize people" and that "overly hierarchical and status-conscious societies will erode. The nation-state may go away." He added: "Developing nations will leapfrog the telecommunications infrastructures of the First World and become more wired (and wireless)."[21]

On its face, this may not be such a ridiculous notion. Conventional social science theory argues that interpersonal relationships can beget community, which can beget widespread solidarity, which can beget enlarging power, which can beget greater authority, which can finally beget revolution. However, a quick check of history and the Internet's historical analogy—the telegraph—shows us that this theory does not quite hold up.

In the nineteenth and early twentieth centuries, the telegraph promised to connect the world as never before. People around the globe marveled that this new technology could now move information with incomparable speed. As Captain George O. Squier of the U.S. Army Signal Corps wrote in the January 1901 issue of *National Geographic*: "The fastest mail express, or the swiftest ocean ship, are as naught compared with the velocity of the electrical impulse which annihilates any terrestrial dimension."[22]

As the telegraph began to spread to all regions of the globe, many intellectuals like Henry Field (a Presbyterian pastor, author, and brother of Cyrus Field, who laid the first direct telegraph cable between Europe and the United States in 1858) began to posit that perhaps this global network could even bring about world peace. He wrote shortly after the trans-Atlantic cable was laid that the telegraph "unites distant nations, making them feel that they are members of one great family. . . . By such strong ties does it tend to bind the human race in unity, peace, and concord."[23] Nearly a century later, similar intellectuals marveled at the astonishing power of the Internet, and its best-known application, the World Wide Web.

In a 1993 article about the nascent web, the *New York Times*'s John Markoff wrote with much of the same tone of marvel that Squier did at the beginning of the century:

> Click the mouse: there's a NASA weather movie taken from a satellite high over the Pacific Ocean. A few more clicks, and one is reading a

> speech by President Clinton, as digitally stored at the University of Missouri. Click-click: a sampler of digital music recordings as compiled by MTV. Click again, et voila: a small digital snapshot reveals whether a certain coffee pot in a computer science laboratory at Cambridge University in England is empty or full.[24]

Perhaps this gee-whiz utopian notion may have worked in the early days of both of these technologies, but as the Internet has spread around the globe, it has not brought a single country that much closer to "harmonizing people"—indeed, crime, conflict, and war all still exist, just as they did at the peak of the telegraph-connected world.

WHAT HAS BEEN HAPPENING in Iran during the two decades since the Internet first arrived is far more interesting than the simple narrative of a young wired generation throwing off the yoke of an oppressive regime. Iran is a key example of a more complicated and protracted struggle between a government and its people online, a constant see-saw situation in which each side can have the upper hand, depending on the week, or sometimes even the day. It's more than just a tale of societal progress and democratization as brought about by the Internet. It's deceptively simple to proclaim that Iran's online voices are "nothing short of a revolution within the [Islamic] Revolution," as the Iranian-British author Nasrin Alavi (a pseudonym), wrote in her 2005 book, *We Are Iran*.[25] Indeed, for every voice yearning for freedom and reformist politics, there are other voices that simply choose not to engage, voices that are silenced by intimidation and threats, and still other voices that are made more cautious by government agents infiltrating or spreading disinformation on social networks.

It is important to recognize the political, economic, and social context in which Iran's unique turmoil online has happened. Iranian politicians did not use Twitter and Facebook by accident. Iconic videos of protestors—and sometimes their tragic deaths—were not disseminated on YouTube randomly.

Iran has a unique political situation as an Islamic Republic that attempts to be semi-democratic within the confines of an authoritarian Islamic regime. In Iran's previous elections, subsequent to the establishment of the Republic in 1980, there were disagreements and even protests. Many younger citizens were frustrated that President Mohammad Khatami's social reforms of the early 2000s did not go far enough to allow for more newspapers and other forms of political freedom. These "reformists" were not calling for an out-and-out overthrow of the Islamic Republic, merely substantial reforms within the larger structure. However, in 2009, large numbers of men, women, and children gathered together in the streets of Iran's biggest cities to fiercely oppose what they believed to be outright fraud in an election that the government proclaimed to be authentically democratic. In other words, the government couldn't even win

an election that was rigged to begin with. After all, it had disqualified many candidates who did not meet the adequate "religious" qualifications.

From an economic standpoint, Iran has been in shambles. Since Ahmadinejad took office, unemployment has been estimated to be as high as 20 percent. Further, 80 percent of Iran's state revenue is taken from oil and gas sales, and the significant drop in oil and gas prices since 2007 has caused that revenue to drop precipitously. Further, President Ahmadinejad has not slackened his economic handouts, low-interest loans, and lots of state spending—leading the country further into debt. Worse still, inflation hovers at 25 percent, with no signs of abating.[26]

These economic troubles are hitting Iran's youth especially hard—this is, after all, a country where half of the population is under twenty-five years old. These "Children of the Revolution" were born after 1979, during a time when Ayatollah Khomeini encouraged Iranian women to have more children while many men were being killed during the 1980–1988 Iran-Iraq war. But now, these children are growing up in a country that can educate them—it was more than ten years ago that women began to outnumber men in Iranian universities—and they are finding that their country cannot adequately provide work and social services for them. So, whether the Islamic Republic likes it or not, an entirely new, educated, and wired generation has grown up in Iran with the Internet, bootleg satellite television, and mobile phones. However, in a country that cannot create enough jobs for them, in a country that restricts sports, music, and other social freedoms (particularly between the sexes), it's no wonder that so many go online as a form of cheap entertainment.[27]

It is this environment of international and domestic political turmoil, economic difficulties, and social restrictions that drives overly educated and under-stimulated Iranians to the Internet. This confluence of events has created a completely unique online outcome that's far more interesting and unpredictable than the Negroponte-style techno-determinism. It's no wonder that Iran was the first country to arrest a blogger (2003), and sadly, the first country to have a blogger die while in prison (2009). It's no wonder that Iran has been active in trying to influence domestic online activity for over a decade, and has engaged in one of the world's most complicated and devious Internet filtration systems, second only to China. It's no wonder that in the aftermath of the June 2009 election the Internet became a key tool in getting information in and out of Iran, as foreign media were barred from the country and the country's own media remained highly restricted. In other words, as the Internet has collided with Iran's political, economic, and social realities, it has created a conflict far more complicated than anyone could have imagined.

JUST LIKE IN IRAN, when the Internet arrives in any country, it bumps up against various preexisting political, economic, social, and cultural histories