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# Toward A Mobile Information Society

## *Globalization of Wireless Technology and Market Evolution*

Dan Steinbock

Upon his return from a trip to Germany in 1936, Paul Galvin, the legendary founder of Motorola, was convinced that war was inevitable. The impressive Autobahns, he said, "have not been built just for autos, they are war roads."<sup>1</sup> By 1940, the equipment manufacturer developed the first handheld two-way radio for the U.S. Army Signal Corps. While Motorola's facilities were quickly converted to military engineering and production, Galvin prodded the defense forces to recognize the military potential of the wireless:

I wonder how many of you realize the importance of radio as a deciding factor in who is going to win the war? What is it that gives the vicious efficiency to vehicles of destruction in modern mechanized warfare? It is radio. What is today revolutionizing aircraft, naval, and anti-aircraft tactics and strategy? It is radio and radar. It is our job—the industry's job—to deliver these precious and important instruments.<sup>2</sup>

After the war years, *Handie-Talkies*, *Walkie-Talkies*, and other wireless offerings served as a bridge to Motorola's early dominance in the commercial wireless business. At the same time, they reflected the critical role of mobile communications in emergency services and for defense purposes. Historically, mobile communications

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have been central to international affairs and national security, from the U.S. Civil War and World War II to the tragedy of 9/11 and the current war on terrorism.<sup>3</sup> The U.S. war in Iraq offered still another example of *mobilization*, specifically mobilization of the Internet, which, among other things, has rapidly transformed the nature of contemporary warfare:

While many of the technologies in use in Iraq have been available for years, it is only now that a critical mass of them have come together to create a truly networked battlefield. The glue that binds the system is the so-called tactical Internet. Deployed in Afghanistan for the first time, the tactical Net is the computer interface used by soldiers to communicate and share information. Special Operations Forces in Afghanistan logged on to a Web page and could read battlefield reports and view video feeds downloaded from the surveillance cameras in Predator drones flying overhead.<sup>4</sup>

Through the past century or more, wireless industry leaders have not been

just technology leaders. From Guglielmo Marconi and wireless telegraphy to Nokia, Qualcomm, and multimedia cellular, wireless players have not survived when they pioneered new technologies but failed in market development, or vice versa. Through these decades, wireless success has been the function of technology leadership and marketing excellence (Figure 1).

### Technology Evolution: From Telegraph to Broadband Cellular.

Through successive waves of wireless innovation, sustaining developments have boosted incumbent leaders. In the process, disruptive change has allowed challengers and new entrants to redefine competitive rules. In the early twentieth century, Marconi deterred his rivals with innovation and patents. In the early twen-

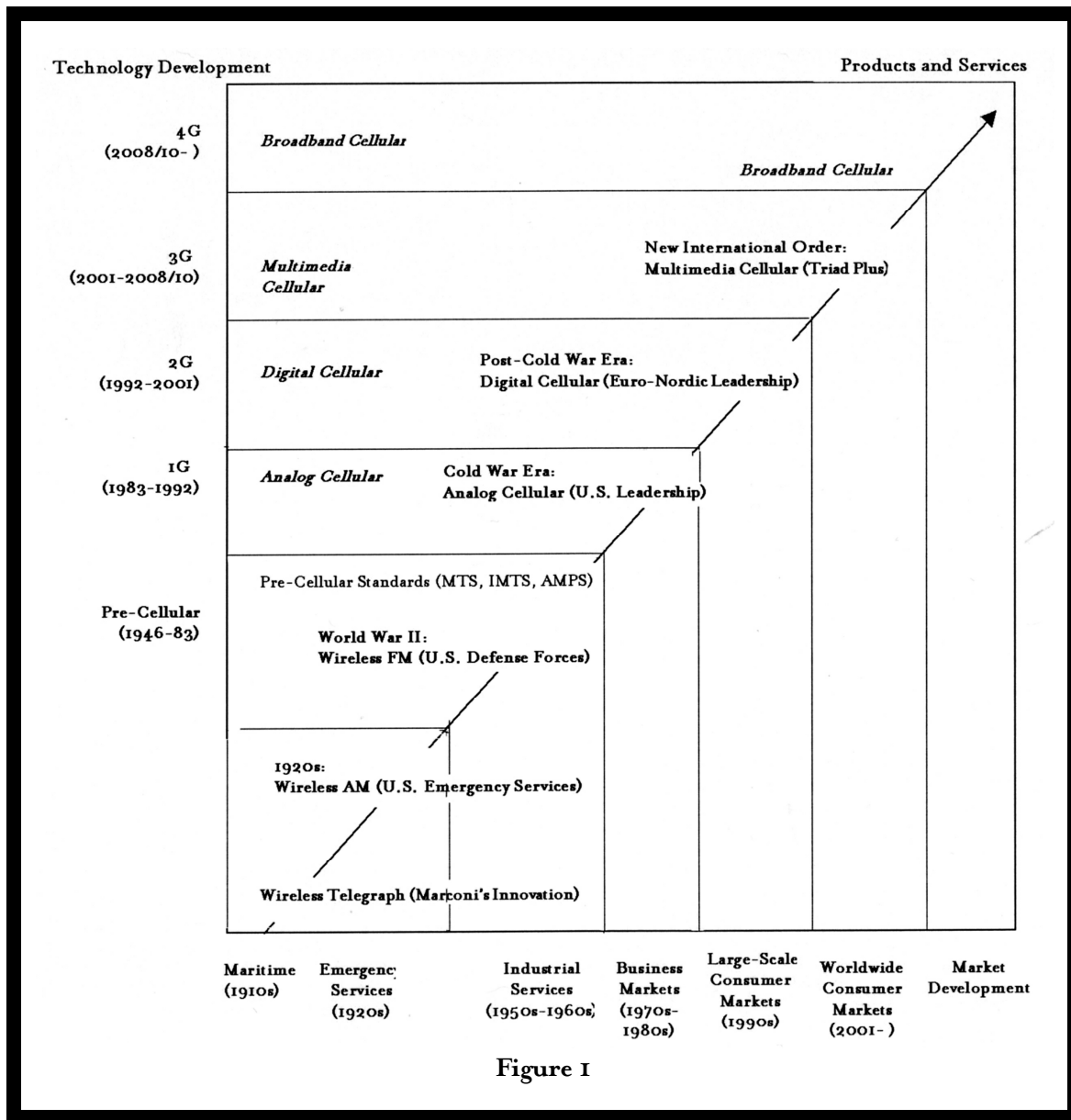


Figure 1

ty-first century, Nokia relies on downstream innovation (global branding, segmentation, and design) to secure a choke point in the competition for the future. At the same time, new technologies have upgraded performance capabilities and cost-efficiencies, from the primitive pre-cellular technologies to analog (1G), digital (2G), multimedia cellular (3G), and, eventually, broadband platforms (4G).

With each wave of innovation, a new technology has been coupled with new and different markets. Historically, wireless markets have evolved as complementary layers, not as substitutes. Initially, military and emergency services built the wireless business, but the thrust has shifted from industrial services to business markets, and then from business markets to consumer markets. In the past two decades, the cellular platforms have contributed to rapid industry globalization.

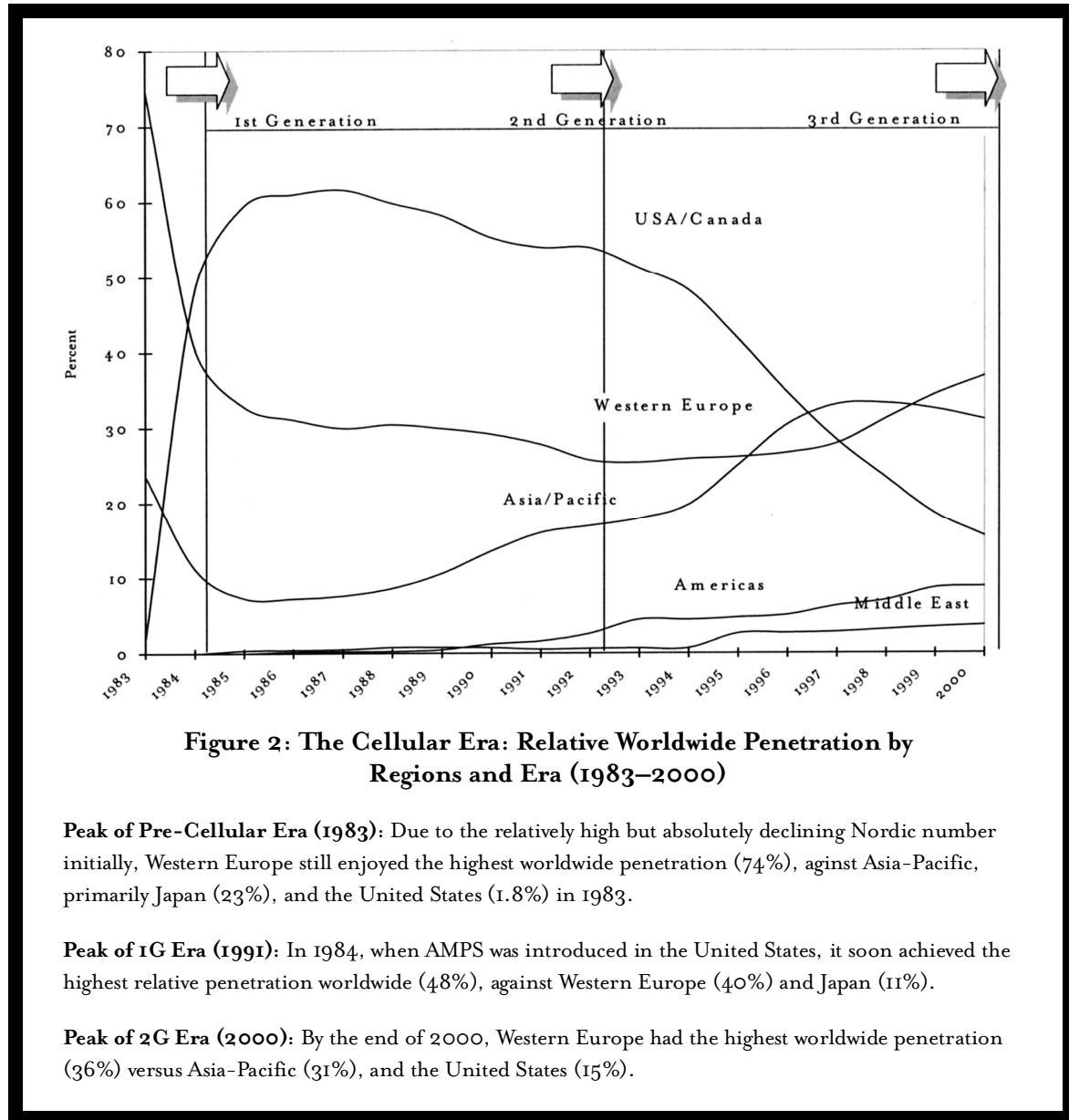
### **Market Evolution: From U.S. Superiority to “Triadization.”**

After World War II, the United States was the critical country market for most industries worldwide. From the 1910s to the 1980s, the United States was also the core cluster and lead market in the wireless industry, but as economies in other parts of the world completed their post-war reconstruction efforts, U.S. dominance declined. Analog systems continued to thrive until the mid-1990s, but success bred complacency. With the triumph of the Global System for Mobile Communications (GSM) in the 1990s, industry leadership migrated to Western Europe, service innovation shifted to Japan, and China took the lead in volume growth (Figure 2).

*The Glory Days of U.S. Leadership: From FM to Cellular.* In the United States,

railroads, telegraph, and telecommunications played key roles in the technology revolution of the late nineteenth century.<sup>5</sup> In particular, wireless innovations have played a critical role in military and information-intensive businesses, from mobile battle conditions during the U.S. Civil War to the rise of electric ticker services and the Dow Jones News Service for Wall Street’s financial markets.<sup>6</sup> In the pre-World War I era, all early radio pioneers built their business models on navy contracts. Marconi’s first order was from Lloyds of London for communication to lightships.<sup>7</sup> As a result of motorization and Prohibition, Detroit’s police department became a pioneer of the ground wireless (AM communications). In 1933, Edwin M. Armstrong, a brilliant electrical engineer and inventor, introduced a wide-band frequency modulation (FM) system that promised great advances in performance capabilities. As the U.S. military opted for FM, significant improvements were made in size, cost, performance, and reliability. Just as Paul Galvin had predicted, wireless devices provided a powerful military advantage during World War II. After the war, this advantage translated to commercial strategic advantages, specifically, the development of cellular technology by Bell Labs researchers in 1947.

*The Cold War Era: The U.S. AMPS Triumph.* By 1945, the Federal Communications Commission began to explore spectrum allocations for multiple uses in a wide variety of industrial services. These “dispatch industries” included police and fire departments, forestry services, electric, gas and water utilities, and transportation services, such as taxis, railroads, buses, streetcars, and trucks. Such pioneering



efforts gave rise to the first industrial and commercial wireless services.<sup>8</sup> Around 1983—at the end of the pre-cellular period and amidst the transition to the 1G era—the United States continued to dominate wireless communications. Through the analog phase, a single standard called Advanced Mobile Phone Service (AMPS) reigned in the most lucrative country

market in the world. However, by this point, the commercialization of the cellular concept in the United States had taken more than 35 years, and the United States no longer enjoyed monopoly leadership in technology, development or commercialization.<sup>9</sup> Since the late 1960s, the Nordic countries had cooperated in the development of a common standard,

NMT. In Asia-Pacific, Japan's early lead quickly eroded as NTT—Japan's national telecommunications operator—favored proprietary technologies rather than open specifications and was not allowed to compete in foreign markets because of esoteric regulations.

*The Post-Cold War Transition: The Euro-Nordic GSM Triumph.* Amidst the transition to the 2G era in 1992, the United States was the most lucrative country market and had the largest worldwide penetration. With digitalization, rapid growth migrated first to the Nordic countries, then to Western Europe. As the European Commission made GSM mandatory in Europe, the regional wireless leaders—the Nordic vendors as well as a new generation of aggressive operators eager to challenge former national telecommunications monopolies—seized the new digital standard to extend their domestic advantages, first regionally and later globally. In Western Europe, the single GSM standard consolidated the fragmented markets; in the United States, multiple standards (TDMA, GSM, CDMA, iDEN) fragmented the consolidated market. The Europeans had learned from the U.S. 1G success; Americans replicated the Europeans' 1G mistakes.

*The Competitive Era: The Worldwide CDMA Triumph.* Over time, the role of wireless technologies has shifted from safety to basic needs, then to instrumental uses, and now finally, to expressive functions. In the pre-cellular era, a wireless phone was confined to emergency services. In the 1G era, the cell phone—more precisely the car phone—penetrated business markets, but remained a household luxury. In the 2G era, the handset became a mass consumer

device. In 1983, there had been some 150,000 mobile telephones in the United States, but they relied on low-technology systems, had poor services, and could not expand due to a lack of available frequency channels. By the 3G transition, the subscriber base was close to 1 billion worldwide. Users relied on high-tech systems and enjoyed relatively sophisticated and moderately-priced services, which were still rapidly expanding in many markets.<sup>10</sup>

Amidst the 3G transition, early estimates indicate that the worldwide revenue for 3G services will soar from \$1 billion in 2002 to \$321 billion in 2010.<sup>11</sup> Over the past few years, simple voice and content have emerged as the strongest service offerings, while Asia-Pacific has surfaced as the growth arena for wireless. Concurrently, CDMA—a new standard developed by Qualcomm—has become the core technology of the 3G era after substantial political maneuvering by key corporations and governments.<sup>12</sup> Meanwhile, the Triad regions of worldwide wireless competition—North America, Europe, and Asia-Pacific—have come to include China.<sup>13</sup>

### **Toward A Mobile Information Society.**

Because of accelerating financial stakes, the coordination of the industry value chain has become an issue of international competitiveness, particularly in the most developed markets of the Triad. In global competition, these changing circumstances are reflected by the rivalry between two quite different geographic and strategic groups. On the one side, European-based mobile leaders, which originated from telecommunications firms, promote vertical industry coordination. On the other side, U.S.-based IT leaders, which originated from computer firms, struggle for horizontal

integration. The Finnish Nokia is leading the Euro-Nordic mobile coalition, whereas Microsoft hopes to dominate the U.S.-based IT players.

Strangely enough, the mobility revolution has evolved behind the spotlight of international affairs, diplomacy, and media, perhaps because the center of innovation is no longer in the United States—the primary arena of international media. Typically, pioneering studies of international affairs and media tend to ignore the role of the wireless industry.<sup>14</sup> Even though U.S. foreign policy has been living in the information age for quite a long time, the information infrastructure policies of the Clinton-Gore era were designed primarily for the *wired* Internet in the early 1990s. The momentum for the *wireless* Internet came only five to ten years later. Indeed, the very logic of a “mobile information society” was initially crafted in Espoo, the suburb of Helsinki and the headquarters of Nokia, not in Washington, DC. As Nokia’s chairman and CEO Jorma Ollila and President Pekka Ala-Pietilä of Nokia noted in 2000:

We are at the beginning of something very significant. Not just for our company. Not just for our industry. But for everyone. And for all aspects of our lives. We are using the twin drivers of the Internet and mobility to break through the limits of time and place. These are very powerful forces...This is what we mean by the Mobile Information Society.<sup>15</sup>

In the near future, mobile media—a highly individualized and interactive “trusted device”—will dramatically transform the existing patterns of media con-

sumption worldwide. In 2003, the sales of handsets, according to leading market research firms, will amount to more than 400 million units worldwide, and an increasing proportion of these unit sales will include “camera phones.” With multimedia messaging (MMS) capabilities, these handsets have substantial implications for international affairs and media. Take, for instance, war reporting. More than three decades ago, Walter Cronkite’s reports from Vietnam forced the Nixon administration to formulate new policies for a changing media era. In the early 1990s, Peter Arnett’s satellite reports from Baghdad compelled the allied forces, the Iraqis, and international organizations to tackle the policy challenge of CNN’s real-time satellite images. But imagine future confrontations—including suicide attacks in the Middle East or a “dirty bomb” in a major metropolitan city—where mobile phone cameras will record anything, anytime, and anywhere to worldwide audiences in real time. Mobile media will enable these sounds, voices, and images only a few years from now.

Indeed, the mobility revolution has extensive implications for international media, journalism, and diplomacy not only in cost-efficiencies but also in differentiation and innovation. With international media and policymaking, the mobility revolution will escalate the transition of bargaining power from government elites to individual consumers. Over time, more than 1 billion citizens worldwide will gradually obtain camera-phone capabilities, while handsets like Nokia’s 750 will be cloned in global mass markets, resulting in increasing performance capabilities for lower prices. This handset along with competing models from Motorola,

Sony-Ericsson, Samsung, and others, will transform communications and the international media and pose extraordinary challenges to diplomacy. Instead of a CNN effect, which has been regional, decidedly centralized, industry-driven, top-down, and one-way, the effect of highly-individualized mobile media will be worldwide, exceedingly distributed, market-driven, bottom-up, and two-way. Therein lies the new challenge that government agencies, diplomats, and international media practitioners are about to face—a challenge that none of them may be prepared for.

America's military power enjoys unipolar superiority.<sup>16</sup> However, there are

now cracks in the armor due to mobility. During the past two decades, U.S. wireless innovation has, at best, enjoyed parity with the core industry clusters (Nordic countries and Japan) and, at worst, fallen well behind. In the past, military technologies shaped mass consumer markets. Today, consumer markets shape military technologies. In the short term, this ensures substantial cost-efficiencies, differentiation, and innovation. In the wireless market, however, U.S. IT leaders are no longer the sole pioneers. Moreover, no single country can any longer dominate the entire industry value chain. Consequently, America's military power is now strategically vulnerable.<sup>17</sup>

## NOTES

1 Harry M. Petrakis, *The Founder's Touch: The Life of Paul Galvin of Motorola* (Chicago: Motorola University Press/J.C. Ferguson Publishing Press, 1965), see Chapter 13.

2 *Ibid.*, 159.

3 See Dan Steinbock, *Wireless Horizon: Strategy and Competition in the Worldwide Mobile Marketplace* (New York: Amacom Books, 2002); *The Nokia Revolution* (New York: Amacom Books, 2001); "Globalization of Wireless Markets" in *Competition for the Mobile Internet*, Dan Steinbock, ed. (Kluwer, Fall 2002).

4 See John Carey and Spencer E. Ante et al., "Point, Click...Fire," *Business Week* (7 April 2003).

5 See Alfred D. Chandler Jr., *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, MA: Harvard University Press, 1977), especially Part Two.

6 See Dan Steinbock, "Building Dynamic Capabilities: The Wall Street Journal Interactive Edition: A Successful Online Subscription Model (1993-2000)," *International Journal of Media Management* 3-4, no 11 (2000).

7 See Gary A. Garrard, *Cellular Communications: Worldwide Market Development* (Boston: Artech House, 1998), Chapter 1.

8 Americans were not alone in developing the first mobile consumer markets (PMR, MTS, IMTS), but the pace of industry evolution was fastest in the United States.

9 Even though the cellular concept was first developed in the Bell Labs, U.S. players fell behind the wireless innovation during this decade. There were several reasons for these delays (compare Steinbock 2002, Chapters 3-4).

10 *Ibid.*

11 That implies annual growth of 37 percent and a

steadily rising adoption curve. UMTS Forum (2002).

12 On the technological and political realignments of the 3G era, see Steinbock (2002), *Wireless Horizon*, Chapter 2.

13 In regional market shares, 1997 was a milestone year: North America lost its penetration leadership to Western Europe. Another benchmark followed in the summer of 2001, when the number of Chinese wireless subscribers exceeded the number of U.S. subscribers.

14 Taylor's pioneering study ignores the role of the wireless, see Philip M. Taylor, *Global Communications, International Affairs and the Media since 1945* (London: Routledge, 1997). See also Wilson P. Dizard, *Digital Diplomacy: U.S. Foreign Policy in the Information Age* (Westport, CT: Greenwood, 2001). On the information infrastructure initiatives, see U.S. Government, *The National Information Infrastructure: U.S. Government, Agenda for Action* (Information Infrastructure Task Force, 1993).

15 See Jorma Ollila and Pekka Ala-Pietilä, "Letter to Our Shareholders," *1999 Nokia Annual Report*, pp. 6-7. In 1995, the now defunct OTA released an important document on the U.S. wireless NII initiatives, but, for all practical purposes, this paper was ignored. At the end of 2000, President Clinton's economic advisers made note of the critical economic significance of the 3G era, but this paper was too little too late.

16 Compare Charles Krauthammer, "The Unipolar Moment," *Foreign Affairs: America and the World* (1990/91); "The Unipolar Moment Revisited," *The National Interest* (Winter 2002/3).

17 See Dan Steinbock, "The Threat from Within: The Unipolar Moment Re-Revised" [Unpublished Manuscript] (2003).