Summary and Reflections

The information revolution is bringing about profound changes in the globe's political and economic life. RAND has embarked on a multi-year effort, sponsored by the National Intelligence Council, to chart the future course of these changes over the next 10-20 years, around the world. As a major part of this effort, RAND is convening a series of international conferences on various aspects of the information revolution. The third conference in this series, reported on here, was held in Washington, D.C., on November 1-2, 2000, focusing on the information revolution in Latin America.

The information revolution is so entwined with the global economy that this conference's discussion about the future of information technology (IT) in Latin America often became a conversation about Latin America's prospects in the emerging global economy. Indeed, the major issues are the same for both subjects:

- the role of government and of the large incumbent, and sometimes protected, local firms;
- the nature of connections to the richer countries, especially the United States, and to their technology, capital and companies; and
- the need to train and retain skilled people, which begins with education but runs far beyond, to safety and living conditions that will attract real or potential "brain drain" by comparison to New York, Miami or Silicon Valley.

So, too, Latin America's challenge in IT is the same as for the global economy: how to, first, get on, then move up the value chain from simple processing – such as Intel's chip-making in Costa Rica – to higher value-added manufacturing or services. Yet it is easy to blur the distinction, as this discussion sometimes did, between "producing" IT and "using" IT effectively to improve other industries. The IT revolution might be thought of in three categories:

- Creating technology;
- Embodying that technology in products or "artifacts"; and
- Offering and using services based on the artifacts.

Certainly, not all Latin American countries can or need to create technology or products to be successful. Not all need to develop IT industries. Perhaps none need to do so. The temptation to think that "making things" is necessary can easily lead to a slippery slope of protectionism and heavy-handed government intervention. Most of the gains from IT will be in services, not objects, in using IT to become more competitive across the board.

Latin America in a Global Context

The subject is not just the Internet or the World Wide Web but the entire range of technologies that are reshaping communications, and the implications of those technologies for business and the economy, politics and governance, and ultimately for how societies organize. The impact of the information revolution touches all of society, and so the different dimensions cannot really be separated. For instance, the role of government is eminently political but also is critical to the business environment. A social dimension, like education, also is at the heart of countries' economic and business opportunities in information technology.

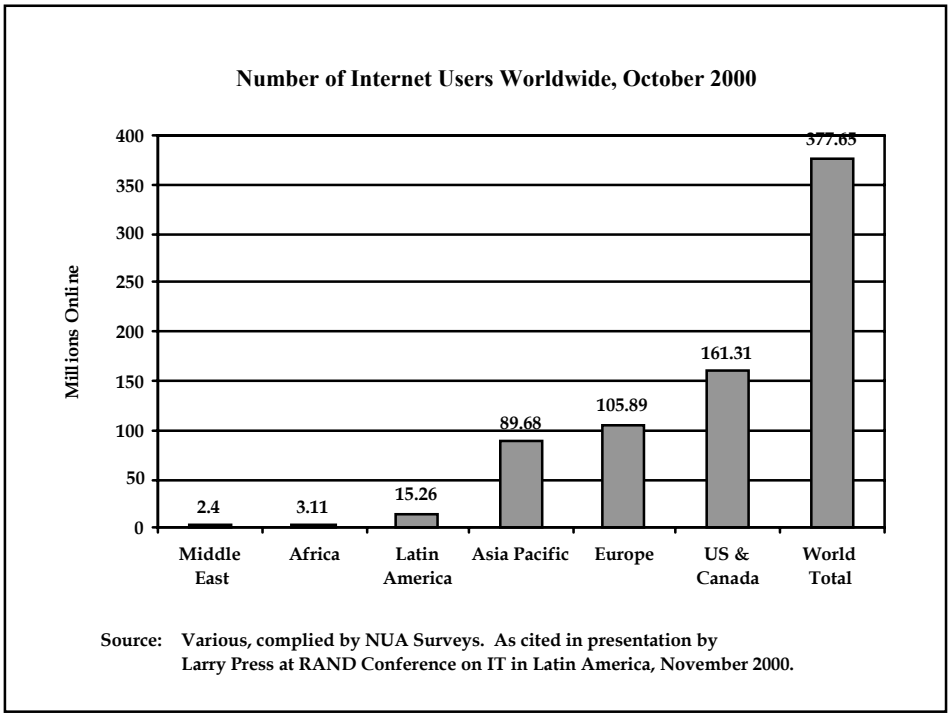
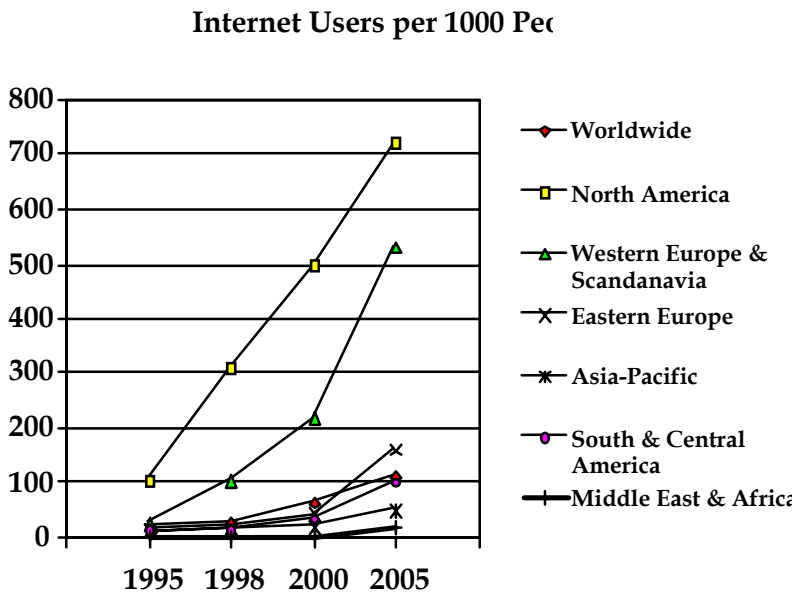


Figure S.1 Number of Internet Users Worldwide, October 2000

As shown in Figures S.1 and S.2, the Internet came late to Latin America, and, while its penetration in that region is still small relative to that in the rest of the world, it is growing rapidly. Only 1.5 percent of Latin Americans have access to the Web today, versus 24 percent of North Americans. Internet penetration is projected to still be less than 12 percent in Latin America in 2005, and most of this penetration will be in the richest 20 percent of the Latin American population, about 100 million people in total. Still, the numbers of end users and host computers are growing faster than the world average.



Source: Computer Industry Almanac, as presented by Larry Press at RAND conference on IT in Latin America, November 2000

Figure S.2 Internet Users per 1,000 People Worldwide

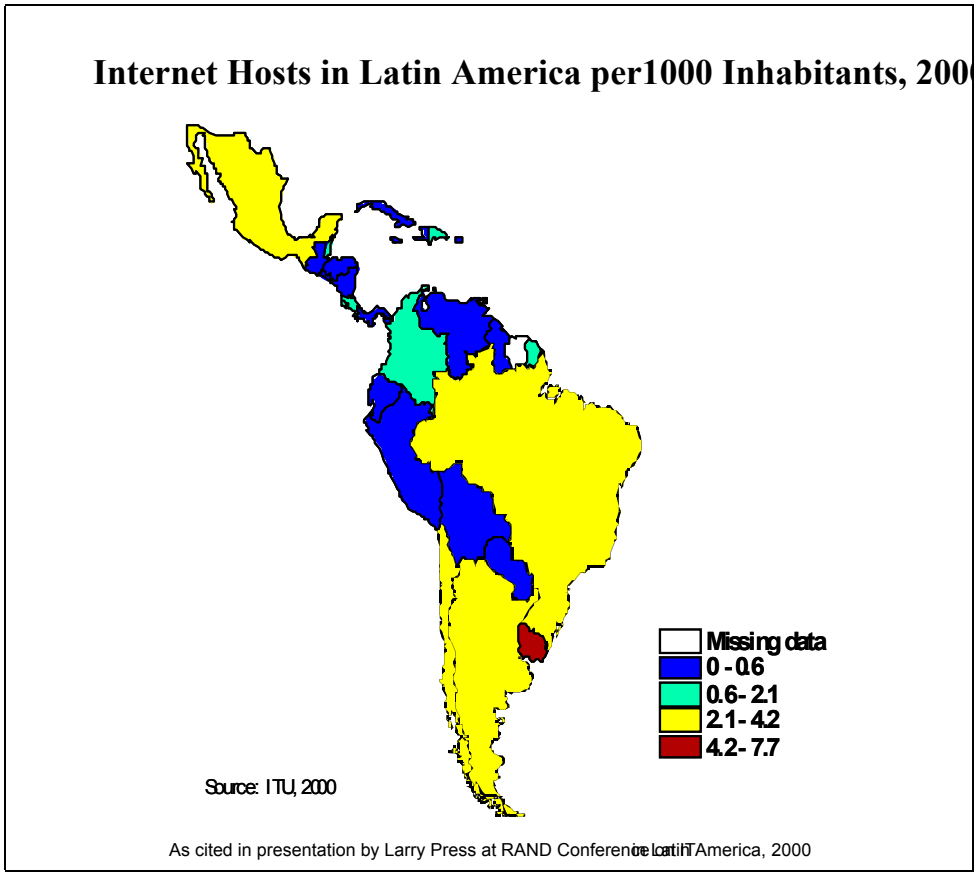


Figure S.3 Internet Hosts in Latin America per 1,000 Inhabitants, 2000

For the information revolution, as for roles in the global economy more generally, there is no "Latin America." Differences across the region are vast, as shown in Figure S.3. Illustratively, the countries might be divided into three groups:

- the "leaders" – Mexico, Brazil, Argentina, Chile and Uruguay;
- the interesting, successful "outliers," like Costa Rica or some of the Caribbean islands, and
- the rest.

These variations across the region notwithstanding, its countries face many similar problems in addressing the information revolution, and they seem unlikely to solve many of them by mimicking the approaches of the world's IT leaders. For instance, e-commerce has been slow to develop not just because few

people are online but also because, in varying combinations, few people have credit cards with which to pay; there is little infrastructure for delivering purchases; and trust in procedures for paying for and getting goods is lacking. Pre-paid cell phone or "smart" cards have been one way around some of these obstacles.

Outside major cities, the information revolution will not come to Latin America with hard wires and modems. It will come with new, wireless technologies, though those will hardly be a panacea. There are, for instance, 100 cellular providers in the region, but, alas, half of the phones are still analog. Third generation cellular phones will communicate at 3 mbps (384 kbps in a moving vehicle), but will not be available in Latin America -- or the United States -- for several years. Moreover, some places will remain hard to reach with cellular technology. Satellite links also hold promise; the cost of a local ground station to serve communities or educational institution is now on the order of $6,000, and in Peru there are now 700 *cabinas públicas* (public outlets, or kiosks) – a franchise operation serving local communities.

The Case of Mexico

Mexico is particular in its connection to the United States and in the power of its dominant incumbent telephone company, Telmex, but it does display most of the issues common to the region's more advanced IT countries. As an aside, the parallels between the Internet today and the railroad boom of the nineteenth century are intriguing. Railroad building in Mexico accounted for half of total economic growth, and there was talk of "railway time" and the "death of distance." Then, as now with the "digital divide," the growing disparity of wealth that resulted from railroad building was cause for concern; owned by foreigners or local oligarchs, railroads generated growth but worsened the income distribution. In Mexico, the backlash against this social impact of the railroads contributed to the Revolution of 1910. The railroad bubble burst, and Mexico has built hardly any railroad track since.

Mexico has 100 million people and a GNP of about a half-trillion dollars, or about a twentieth that of the United States. Its population is young, with seventy percent under 35 years of age, and the income distribution is skewed, with the top twenty percent of the population accounting for 58 percent of income (about the same, however, as in the United States). As Table S.1 shows, that top 20 percent of the population is much more penetrated by the various communications technologies than are Mexicans in general.

IT Penetration in Mexico by Access Device (%of population)		
	Total (%)	**Richest 20% (%)**
Fixed lines	11.5	33.4
Wireless	7.6	22.0
Total lines	19.1	55.5
PC	5.6	16.2
Internet (estimate)	1.6	4.6
TV	87.0	100.0
Cable TV	11.0	31.9

Source: Telmex, Goldman Sachs, and author, as presented by Timothy Heyman at RAND Conference on IT in Latin America, 2000

Table S.1: Internet Penetration by Access Device

As shown in Figure S.4, current trends suggest exponential growth in Web access, from the current one-percent penetration among homes and slightly higher penetration among businesses to approximately 18 percent among homes and 26 percent among business by 2010. This growth, however, is likely to be concentrated among the richest 20 percent of Mexicans.

Mexico's companies that are relevant to IT can be divided into seven categories – connectivity providers, old economy incumbents, Telmex, the media, banks, new economy start-ups, and global Internet companies. Telmex stands out. It monopolizes the "last mile" of wire to the consumers, controlling 99 percent of local telephones. It has more flexibility than the incumbent telephone companies in other Latin American countries, which either had to develop their Internet strategies outside their corporate structure, or were legally barred from becoming Internet service providers (ISPs), as in Brazil. In Mexico, Telmex currently controls 58 percent of all Web accounts. It accounts for a third of the Mexican stock market, and it is controlled by one man -- Carlos Slim, Latin America's wealthiest businessman, who also owns Prodigy Inc., the third-largest ISP in the United States, and who recently bought CompUSA.

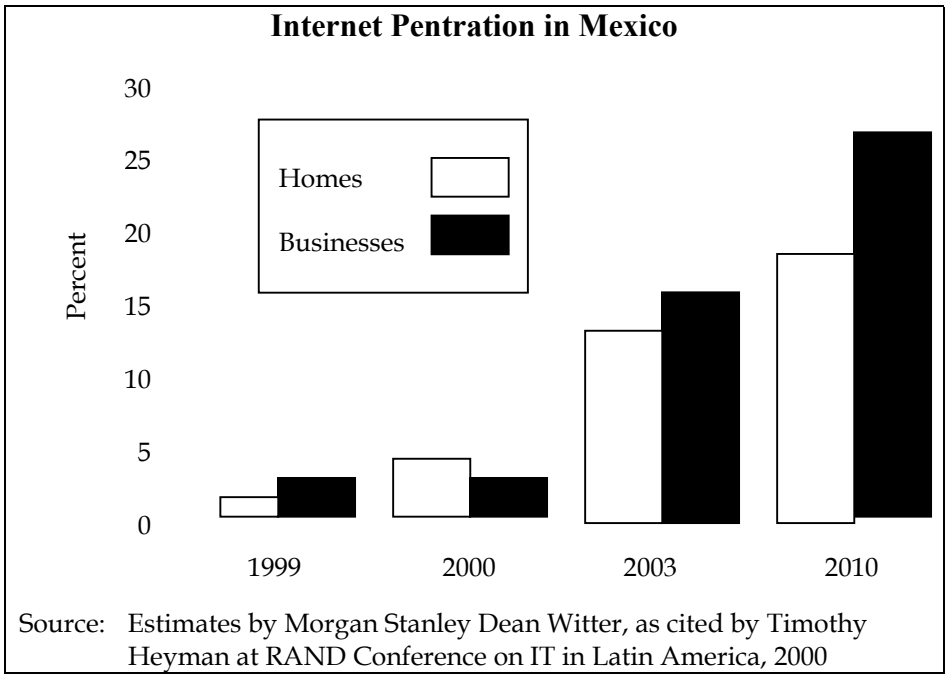


Figure S.4 : Internet Penetration in Mexico

Telmex aside, the obstacles to the development of IT and e-commerce in Mexico are familiar across the region. There are few Internet start-ups, and, especially given the problem of financing, most of those are organized outside the country even if they intend to conduct business in Mexico. The 125 firms in Mexico's own "Silicon *Valle*," (valley), where IT start-ups are beginning to thrive, are all, like the railroads a century ago, foreign-owned -- four-fifths American and the rest Asian. Global Internet companies have a presence in Mexico, but neither Mexico nor Latin America more generally is a priority for them. Advertising on the Internet has yet to take-off as a revenue source, and Internet connectivity as a revenue stream is dominated by Telmex. There are 44 other ISPs in Mexico, but the fact that they have, on average, fewer than 200,000 subscribers each suggests future consolidation among providers.

E-commerce is hampered, as everywhere in Latin America, by how to pay and how to deliver. In Mexico the problem is not the lack of credit cards, for the country has some eight million, but there is nothing comparable to the U.S. sales tax advantage in buying online. For these reasons, business to business e-commerce (B2B) is more promising than business to consumer e-commerce

(B2C). Mexico does have one important "pull" factor that is unique to it. The just-in-time inventory needs of the *maquiladoras* -- processing operations, mostly in consumer electronics, whose inputs can be imported duty free provided all the products are exported -- on its northern border provide a powerful incentive to *use* IT. Foreign direct investment in the country has grown from $4 billion annually to $13 billion since NAFTA, the North America Free Trade Agreement, came into effect in 1995.

The Successful "Outliers"

Costa Rica and some of the island states in the Caribbean – the Cayman Islands, the Bahamas, St. Barts, Aruba, the British Virgin Islands, and the U.S. Virgin Islands – are notable in being further along, not in making but in using IT. These outliers share several preconditions: their governments are founded on trust and transparency; they have a well-established rule of law, high literacy rates, economic cultures in which business can prosper, populations that are fluent in English (in Costa Rica's case, tolerable working knowledge), and, perhaps most important, political stability. The islands demonstrate that it is not necessary to produce IT to use it effectively, and that even small countries can do so. Their IT advances were driven by the needs of their commerce – tourism and banking, including, unfortunately, money laundering.

In attracting Intel, Costa Rica took political risks, like committing to teach English in primary schools. Intel now accounts for a sizeable fraction of the country's economy. The country is thus involved in producing, or at least assembling, IT artifacts, but its tourism industry has also been a driver of IT use. It has the advantage of a world-class business school, INCAE, which was founded with assistance from the Harvard Business School.

Creating Niches…and the Skilled People for Them

In talking about the need for human capital, the conversation about IT becomes very much that about economic progress more generally. It takes skilled people to use IT, much less produce it, but the same is true for many other aspects of economic life. In much of northern South America, skilled people who can leave, do leave, most often for the United States. They are pushed out by violence, by the lack of opportunities and by populist politics that discourage innovation and individual enrichment. In the process, Miami is becoming a kind of economic and cultural "capital" of Latin America. Given the large market for Spanish-

language content, not only in Latin America but also throughout the entire Spanish-speaking world – only 2 percent of Web content is now in Spanish -– the region has the opportunity to produce content. Yet it will have to compete with Miami, which now has advantages in infrastructure and financing.

Education is a primary obstacle to narrowing the income gap in Latin America. Dropout rates are high, repeat rates in primary school are very high, teaching materials are outdated, and the worst teachers are in the primary schools. At the university level, teachers are ill paid, and so moonlighting and part-time teaching are the norm. Unions and bureaucracy create barriers to innovation, and the upper classes send their children to private schools.

There are, to be sure, some points of excellence. Mexico is noted for UNAM (Universidad Nacional Autónoma de México, or Autonomous National University of Mexico), as well as the Monterrey Technical Institute, which has 27 branch campuses and an innovative virtual learning program. Brazil stands out for its university-related incubator programs and growing indigenous venture capital market, while Chile has its secondary school *Enlaces* (links) program that will eventually introduce more IT-interested students into the already successful higher education system. Biological science and agriculture are strengths in both Argentina and Uruguay.

Government and IT, and Vice Versa

The role of government is critical to the development of IT, and government and politics will in turn be reshaped by the information revolution. The United States has taken the global lead in IT with a government role mostly confined to staying out of the way. The process might be labeled, in Joseph Schumpeter's words, "creative destruction."[1] In contrast, many Europeans would prefer a more predictable, more controlled, government-led process. Latin America seems somewhere in the middle, moving toward the U.S. model but with strong vestiges of state intervention. Latin America's best and brightest now go to study in the United States, not Europe as in former times, and the faintly Marxist cant against business and business schools has waned.

But might Latin American governments again enact high barriers to make sure that foreign companies don't overwhelm the domestic companies as they did in the 1970s? Will information entrepreneurs in the region want governments to

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[1] See Schumpeter (1942), particularly pp. 81-86, for the original statement of the "creative destruction" thesis.

stay out of the way or protect them? The answers are directly related to assumptions about the role of IT in development more generally. If growth is believed to ensue because countries *make* IT products, the policy logically becomes one of protection and import-substitution. Instead, if growth is believed to result from *using* IT products, then import-substitution is inappropriate. The temptation to make things is giving import substitution some renewed favor, for better or worse.

Governments are relatively larger in Latin America than in the United States, and thus they will be important users of IT. Brazilians can vote online, and sixty percent of Brazilian income tax returns are filed online. Yet, on the whole, the region's governments have taken a "fiscal," rather than a "consumer," approach to IT; taxes and duties have kept prices high – and so computers costs twice as much in Venezuela as in the United States. Governments pay lip service, but seldom much more than that, to IT as a means of increasing the transparency of governance. And advertisers are not willing, in many countries, to support media, either traditional or new, that oppose ruling governments.

As governments learn about the potential dangers of the Internet (to them), they may attempt to move against it in various ways, but they will also face sharp limits on how much they can control information flows. A recent case is suggestive of those limits. When Venezuelan president Hugo Chavez made a deal with Cuba's Castro, many of the deal's provisions – like bartering Venezuelan goods for Cuban doctor and other professional services – were questionable in the norms of international trade. The Venezuelan government was able to suppress details of the deal from traditional media, but those details did leak out via the Web.

North-South Connections

The hub-and-spoke configuration of fiber optic cables is a metaphor for Latin America's connections to the richer countries, especially the United States. As shown in Figure S.5, those cables link Latin American countries to the United States, not to each other. The metaphor evokes concerns regarding national security and national autonomy – powerful echoes in Latin American history. Yet in the short run, the main concern about the cable configuration is price, and it is not obvious that the current arrangement is more expensive than a string of low-traffic cables around Latin America would be, quite the contrary.

Figure S.5. International IP Links

Prices will come down, as photonics make possible a several order of magnitude increase in bandwidth.[2] Yet if that advance, like previous ones, is exploited fastest in the United States and Europe, they may jump ahead again, leaving Latin America just as far behind, perhaps even further. Latin America didn't close the gap during the industrial revolution, so is there any reason to believe

[2] This is discussed in Anderson et al (2000).

that it might during the information revolution? Thus, it doesn't take a commitment to 1970s style "dependence theory" for a Latin American to worry that the existing global "game" is rigged against it.[3] If Latin America becomes more and more integrated in a U.S.-led global economy, it may be able to have a piece of the action; but can it have its own action? Can any country in the global economy? Is it such a bad thing that all the cable lines run north and south, if Latin America is trying to develop technologically? If the region is to integrate into a global economy, its technical people have to be connected to those at the top of the game, and that top is now Silicon Valley.

Mexico decided through NAFTA that it couldn't escape the United States and so should benefit from the U.S. economy as best it could. It weathered the financial crises of the 1990s better than other regions because it was so closely tied to a booming U.S. economy. Other nations will not choose or be able to connect themselves so directly to IT's dominant nation.

Desires for national or regional autonomy will persist, and they will continue to lure Latin American nations in the direction of policies, like protection and import substitution, that are destined to fail. In the world of the global information economy, to opt out is to opt for poverty. Autonomy does not mean disconnecting but, rather, trying to structure connections to the global economy in a way that will provide maximum advantage to the nation and its citizens.

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[3] By this theory, the structure of international economics advantaged the industrial countries at the center and destined the poorer ones on the periphery to a dependent position. The terms of trade ran against the latter's agricultural and mineral exports, and their ability to move up the ladder to more capital-intensive production was limited by the structure and operations of multilateral corporations, especially with regard to technology transfer, the availability of capital, and the co-opting of elites from the periphery by the companies and institutions of the center. See, for instance, Cardoso and Faletto (1979). For a critique, see Packenham (1992).