

# The Mobility Explosion: shaping innovation and technology needs

Technology Horizons Program | SR 1052

## 1 | INTRODUCTION: THE MOBILITY EXPLOSION

Everywhere we look today, the rules of innovation are changing. In *Innovation in the Urban Wilderness* (SR-1050), we investigate how the growth of megacities and slums is creating new crucibles of innovation that combine lightweight technologies and cooperative strategy to solve problems. In this report, *The Mobility Explosion: Shaping Innovation and Technology Needs* (SR-1052), we turn to the other great driver of change in today's global economy—the explosion of personal mobility of all kinds across the world's largest markets.

Why look at mobility? There are three key reasons. First, physical mobility exposes people to new places, relationships, and ideas. It is a major driver for sparking and diffusing innovation. Experts in regional innovation long ago discovered that places with mobile populations, such as Silicon Valley today or Florence, Italy during the Renaissance, serve as meeting places for people with different backgrounds, skills, and ideas. This mixing fosters creativity and innovation. As Sir Peter Hall eloquently wrote in *Cities in Civilization*, “People meet, people talk, listen to each other's ideas, music, and each other's words, take in each other's thoughts. By accidents of geography, sparks may be struck and something new comes out of the encounter.” Not surprisingly, ports and other cities that have served as crossroads have produced the most important innovations throughout history, from Athens in the 5th century B.C. to Los Angeles today. Historian Jared Diamond theorized in *Guns, Germs and Steel* that East–West mobility and the exchange of innovations that resulted was a key reason why industrial and scientific progress flourished in Europe, rather than Africa and the Americas. Today, some 2.7 million students study abroad every year—a quantifiable measure of the importance of being exposed to new ideas.

A second reason we're interested in mobility is because it is so deeply intertwined with the patterns of daily life. As our research on place and space shows (*The New Spatial Landscape*, SR-834), the way we choose to move through the world determines the kinds of images we see and the resources we need. But personal mobility is changing rapidly with the addition of ever-more portable technologies. Routes of travel are important tools for organizing daily activities. But increasingly, routes are determined on the fly by the flows of virtual information received on mobile devices. The 20th-century norm of scheduled appointments and fixed meeting places is rapidly being replaced by a new norm of ad hoc meetings, both in terms of time and place.

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The third, and perhaps most important, reason we're looking at mobility is that today's mobility explosion does not respect traditional economic barriers—it is on the rise in both rich and poor countries, and often makes unexpected leaps across economic divides. In fact, the mobility explosion will be experienced in force in the key markets of Brazil, Russia, India, and China (BRIC). One important difference to note, however, between the experiences in the developed and developing world is that in the developing world, the mobility explosion will often occur in the absence of the necessary infrastructure to truly accommodate it, and in turn create extreme mobility conditions such as congestion, infrastructure strains and failures, environmental decay, and very long commutes.

What is interesting about the mobility explosion is that it will bring populations that have traditionally not been viewed as highly mobile into the mobility fold. The new mobile populations will not only include the highly affluent global elites but rural poor, less affluent migrants, and those displaced by environmental, political, and economic pressures.

With new forms of mobility emerging and people all around the world experiencing an explosion in their mobility, this is an opportune time for organizations to reflect on:

- What are the key dimensions of mobility?
- What innovations, new opportunities, and challenges will be created by an explosion in various dimensions of mobility?



## 2 | DIMENSIONS OF MOBILITY IN THE 21ST CENTURY

To better understand how the mobility explosion is affecting the world's most important markets, we identified six dimensions of mobility that are important for organizations to understand and track.

- 1. Physical mobility.** The movement of people by air, rail, and automobile that is exposing people to new places, resources, and people and also shaping requirements and the use of many personal technology devices.
- 2. Residential mobility.** Changes in the places where people live on a local and global scale are shaping product and service requirements as well as widening social and family networks.
- 3. Social and economic mobility.** The ability to change social standing as a result of education or marriage is opening opportunities for higher incomes and improved quality of life. This aspect of mobility is a key driver in shaping consumer populations and their preferences for goods and services.
- 4. Virtual mobility.** The ability to project one's influence by using information and communications tools is allowing for remote control and coordination, and the enhancement of social connectivity. Virtual mobility exposes individuals to new ideas and new spheres of influence independent of or in conjunction with physical travel.
- 5. Financial mobility.** The ability of individuals to manage the flow of funds across space and time means increased movement of money across national borders and social barriers, and more opportunities borrow money through traditional consumer credit channels and emerging options like micro-loans.
- 6. Ephemeral mobility.** The temporary movements of people, both voluntary and involuntary, are endemic in a more crowded and urbanized world and generate need for temporary and often lightweight infrastructures.

### 1. PHYSICAL MOBILITY | As the BRIC countries industrialize and urbanize, record numbers of people will seeking the benefits of personal physical mobility

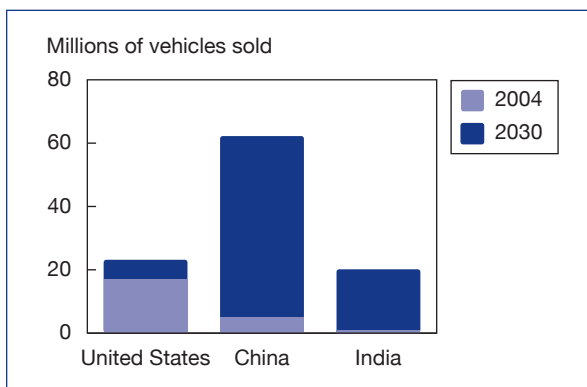
Physical movement is the most basic form of mobility and is important because it exposes individuals and groups to new places, ideas and people. Physical movement is also connected to every other dimension of mobility discussed in this report. For example, virtual mobility drives the need to travel for meetings with distant colleagues. In the same sense, socioeconomic mobility spurs demands for recreational travel. Financial mobility provides a magnet that both pushes people and resources to growing places and pulls them away from declining ones. Thus while other forms of mobility are expanding, they all contribute to ever-expanding physical mobility.

#### Key Future Drivers

##### Shift from Public to Personal Mobility

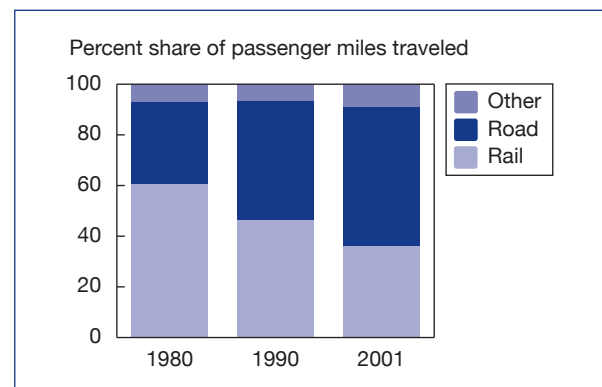
As the BRIC countries industrialize and urbanize, large numbers of people are shifting from shared forms of transportation to more personal ones. The most important trend is the decisive shift away from railroads toward the automobile as the primary means for moving passengers and freight. Even in India, where personal ownership of cars is still rare, roads carry nearly 65% of freight and 87% of passenger traffic. In China over the last 20 years, the automobile rapidly has surpassed and eclipsed rail as the main means of passenger travel.

#### Rapid Growth in Car Market Expected in China and India



Source: "The World's Top Auto Markets by 2030." Keystone India, retrieved from [www.financialexpress.com/fe\\_full\\_story.php?content\\_id=110214](http://www.financialexpress.com/fe_full_story.php?content_id=110214).

#### China Switches from Road to Rail



Source: DaimlerChrysler



### Cheap Air Transport Enables More People to Travel

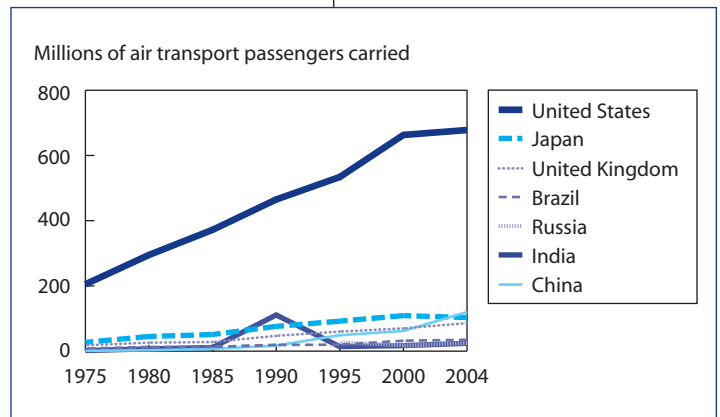
The car is just one disruptive technology for physical mobility: the plane is another, and despite its already enormous impact on every aspect of life, commercial aviation will continue to reshape the way we think of place and mobility for decades to come.

Despite ongoing security threats to civilian airliners, worldwide passenger traffic has rebounded and surpassed pre-2001. An important part of that story is the rapid global expansion of low-cost airlines, which are enabling people to fly before they even own a car. Brazilian carrier Gol has captured one-third of the domestic market—fully 15% of its riders are first-time flyers. In India, Bangalore-based Air Deccan and Kingfisher Airlines are challenging incumbents Jet Airways and government-owned Indian Airlines. There are now over 4 million low-cost seats available annually in the Asia-Pacific region, up from just 600,000 five years ago.

### Remote Communications Drive Physical Mobility

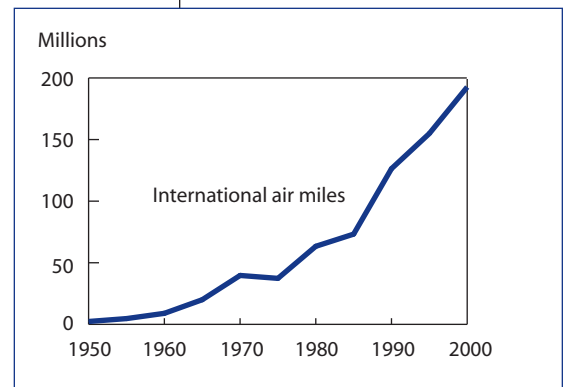
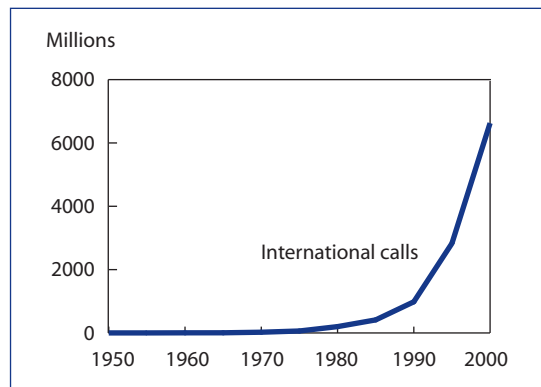
While many people think of telecommunications as a replacement or substitute for physical mobility, they in fact are powerful drivers of each other. As easy and more frequent travel exposes people to new friends, customers, and collaborators, new communications tools let them build and sustain those ties over ever greater distances in richer and richer modes of expression. So, despite a rapid expansion in international telephone traffic in the last decade, overseas business travel continues a robust 50-year expansion.

### Air Travel Mobilizes the Global Economy



Source: World Bank, *World Development Indicators*, 2005.

### International Telephone Traffic and Air Travel from the United States Have Grown Together



Source: Sangho Choo, University of California at Davis.

### In the Next Decade

#### **The Car Will Redefine the Developing World, But Will Itself Be Transformed**

China and India, and to a lesser extent Russia and Brazil, will be transformed by the car. By 2020, Chinese car ownership rates may rival those of the developed countries. But a lack of space in congested megacities, and the environmental and political toll of mass car ownership will force the car to adapt to survive. This will create powerful drivers for local innovation in every area from alternative fuels and vehicles to new ways of managing traffic, distributed work, and recreation.

#### **Low-Cost Aviation Will Drive a New Era of “Regional” Globalization**

Despite post-9/11 security concerns, economic globalization, migration streams, and tourism are virtually unstoppable drivers of growth in the aviation industry. In the developed countries, air travel will continue to grow at 5% annually — while dynamic markets like China and India will see 10–15% sustained annual passenger growth over the next decade. Yet, as we are currently seeing in the European Union, the growth of low-cost regional carriers will create new cross-border communities *within* regions such as Southeast Asia, the Middle East, and Greater China, driving the formation of new regional markets and innovation centers.

#### **User-Generated Innovation Will Emerge at the Physical–Virtual Boundary**

The links between travel and communications are clear: international air travel and international phone calls; personal cars and mobile phones. Companies will prosper by providing tools that provide innovative solutions to the more flexible, ad hoc forms of mobility that arise from this intersection. But the most successful products at the physical–virtual boundary are increasingly user-generated innovations, like the mobile-phone based social, networking service Dodgeball, that create and reinforce links between physical and virtual mobility.



## 2. RESIDENTIAL MOBILITY | Growing cities vault China and India into the global economy while a new global talent elite emerges

Residential mobility is the permanent relocation of one’s home to a new community, and is a good indicator of openness in societies. For many generations, Americans have moved freely, settling in new places while pursuing new economic opportunities. Residential mobility allows people to expand their social networks as they acquire and build relationships with new neighbors, co-workers, and acquaintances. Thus it often encourages the cross-fertilization of ideas and practices as people learn new ways of doing things, new languages, and new approaches. This is why places that are at the crossroads of mobile populations are known for innovation and creativity.

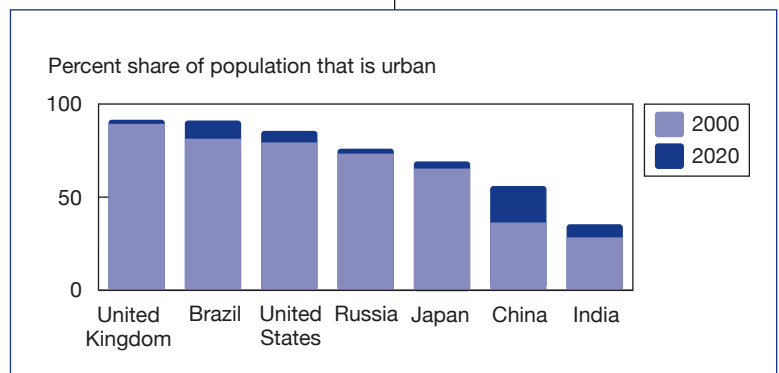
The two important trends in residential mobility are the rapid urbanization of developing countries and the globalization of labor migration. Today approximately 50% of the world’s population lives in cities. According to United Nations forecasts, this will rise to 70% by 2050 and 90% by the end of this century. Despite powerful government obstacles to rural–urban migration, such as residency permits used in Russia and China, cities are growing rapidly as people seek economic and social opportunities. China’s urban areas, already home to around 560 million people, will need to accommodate another 300 million people by 2020. Once they reach the city, however, a rapidly expanding number of people are venturing ever further afield—to other nations—in search of opportunity.

### Key Future Drivers

#### Large-Scale Migration from Rural to Urban Areas

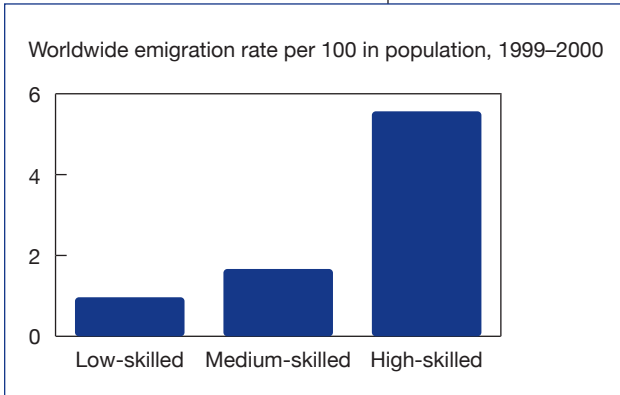
Cities are growing rapidly around the world, in population size, influence, and economic vitality. As the international economy continues to shift to a global one, cities serve as key nodes for organizing flows of people, information, goods, and money. The United States, United Kingdom, Japan, Russia, and Brazil are all urban nations, with 70–90% of their populations living in cities. China and India, though, are the demographic weathervanes for world urbanization, as they continue to see their urban populations expand rapidly through 2020 and beyond.

#### An Increasingly Urban World



Source: United Nations, *World Population Prospects: The 2004 Revision and World Urbanization Prospects*.

### Higher Skills Enable Greater Mobility



Source: Frederic Docquier and Hillel Rappaport, "Skilled migration: The perspective of developing countries," *World Bank Policy Research Working Paper No. 3382*, November 2004.

### Foreign-Born Populations Vary from Large and Growing to Very Small and Steady

Percent of population that is foreign born

	1995	2005
United States	11	13
United Kingdom	7	9
Russia	8	8
Japan	1	2
India	1	1
Brazil	<1	<1
China	<1	<1

Source: World Bank, *World Development Indicators*, 2005.

### Skilled Elites Enter the Migration Stream

Traditionally, migration streams have been dominated by economic and political refugees. The history of immigration to the United States is filled with stories of oppressed and downtrodden peoples seeking respite, including the Pilgrims seeking religious freedom and the Irish suffering from the Potato Famine. Increasingly, however, modern migrants more likely to be highly skilled. Indeed, recent economic research has shown high-skilled workers are more than five times more likely to leave their country of birth than low-skilled workers. And as globalization creates new demands for skilled workers, national boundaries will present less of a barrier to migration. In fact, many countries, such as Australia and Canada, have designed immigration policies that explicitly seek to attract such skilled nomads.

### New Kinds of Melting Pots

The regions that attract migrants benefit from the new ideas and cultural influences newcomers bring with them. Over the last decade, the United States and United Kingdom have experienced growth in their foreign-born populations, as increasing numbers of immigrants arrive.

The BRIC countries, however, are creating a different sort of melting pot. They are not net importers of people—the number and relative share of foreigners living in these nations is very small and not increasing. Specifically, Shanghai and Bangalore don't resemble New York and London as magnets for diverse global migrant groups. Rather, they attract two primary groups of migrants—people from rural areas of the country, and highly-skilled workers returning from overseas.





## In the Next Decade

### **China and India's Urban Centers Will Emerge as New Innovation Hubs**

New York, Los Angeles, and Tokyo were the dynamic, rapidly expanding hubs of the 20th century—they served as centers for investment, magnets for skilled migrants, and centers of innovation. New urban hotspots will emerge in the 21st century—namely China and India—which will become cultural and economic magnets for rapidly changing and ascendant societies and economies. They will serve as sources of creative capital for the global economy, and harvest the knowledge of returning émigrés. Over the next ten years, we'll see signs that places like Beijing and Bangalore are moving up the value chain of the global economy and taking their place alongside the great centers of innovation. Already we are seeing an increase in the numbers of American and European students studying in China and India. Many of the Indian companies in Bangalore have started recruiting college graduates from OECD countries.

### **The Mobile Global Elite Will Expand Rapidly**

The international migration of elites is nothing new—the rich have always enjoyed a high degree of global mobility (think of the “Jet Set”) and the poor have been on the move in search of safe havens and economic security. But what is new today is the large numbers of highly-skilled people who are willing and able to move abroad to pursue educational and job opportunities. This group will expand rapidly, especially in China and India, where overseas experience will continue to grant them a competitive edge. But we'll also see an increased willingness of the young, diverse, and Web-savvy populations of developed countries like the United States and United Kingdom to seek opportunities abroad.

### 3. SOCIAL AND ECONOMIC MOBILITY | Mobile populations in BRIC nations will set new consumption standards

High levels of social and economic mobility—that is, the movement between socioeconomic groups—is one of the key indicators of vibrancy and openness in a society. For decades, the U.S. economy’s dynamism was attributed to the ability of its population to rise above class and economic boundaries determined by birth. In more class-, caste-, or tribe-oriented societies, such opportunities are limited as people’s educational and occupational futures are pre-destined based on inherited status rather than ability. Social and economic mobility are important determining factor in shaping consumption patterns, and driving demand for products and services. Movement of people into higher socioeconomic strata increases demand for goods and services; thus it is not in vain that corporations track the growth of the middle class in emerging economies. Global media are replete with stories about the emergence of the middle class in developing countries—be it the 250-million-strong middle class in India or the burgeoning urban middle class in China whose spending power will redefine the consumer market there. Socioeconomic mobility is also intimately linked to other types of mobility—physical, people with higher incomes are able to travel more; virtual, as income increases so does the ability to purchase information and communications technologies and services.

Social and economic mobility are determined by two factors—the shifting of people in social spaces as they pass through different life stages—marriage, parenthood, and divorce; and individual’s ranking in society that is a function of income, education, and employment. As people resequence their life stages, there will be growth of nontraditional households leading to higher social mobility, and economic growth in the BRICs will open doors for individual economic mobility.



## Key Future Drivers

### The Changing Nature of Households Globally

Marriage, childbearing, and divorce are key determinants the social structure and mobility of households. The dominant household structures in all societies are undergoing tremendous flux for three reasons. First, women are deciding to have fewer children and postpone childbirth to participate in the labor force. Second, the divorce rate is rising across the board, most rapidly where traditional societies are facing rapid changes in economic futures—like in China and India. The divorce rate has doubled in China in the last 20 years, and even India has seen a surge in divorce, particularly in urban areas. Third, while more than 90% of people in these countries are married by their forties, the average age at marriage is rising everywhere, as young people take greater freedom in choosing partners and engage in life stage sequencing. An end result is the growth in nontraditional households—be it the movement from multi-generational to nuclear families in India or married couples becoming a minority in the United States—an overall increase in the number of households globally as more people live in smaller families or on their own. In China, the average household size is expected to shrink from 3.8 to 2.7 in 2015, during the same time period an Indian household will go from having 5.6 persons to 4.8.

### Growing Middle Classes, Accompanied by Larger Income Disparities

While the middle classes in the United States, Japan, and United Kingdom are having a hard time maintaining their standard of living, the middle classes in India and China are growing propelled by soaring economic growth in these two countries. Oil-propelled growth in Russia is expected to lead to a resurgence of middle class there as well.

While the number of middle-class households is increasing in BRICs, income distribution in these countries and beyond is becoming more uneven. This is important because the distribution of income among individuals in a country is a powerful driver of economic mobility. Economists use the Gini coefficient to measure income inequality. It ranges from zero (meaning that everyone has the same income) to 1 (one person receives all the income). A look at this indicator over time shows that income inequality has increased in all the countries of our study. What does this mean? It basically means that the rich are getting richer, which ultimately means limited opportunities for economic mobility.

### Number of Households Increasing Worldwide, Especially in India and China

Millions of households	1990	2005
United Kingdom	23	26
Brazil	35	50
Japan	41	49
United States	93	113
India	149	206
China	277	372

Source: Euromonitor

### In the 1980s and 1990s Inequality Grew Across the Board

Gini coefficient	1980	2000
United Kingdom	0.249	0.360
United States	0.352	0.408
Japan	0.334	0.379
Brazil	0.578	0.591
India	0.318	0.325
China	0.320	0.447

Source: William Rankin, Harvard University.

**Global Expansion in Tertiary Education**

Gross enrollment rate at the tertiary level\*

	2000	2004
United States	69	82
United Kingdom	58	60
Japan	47	54
Brazil	16	n/a
Russia	n/a	68
India	10	12
China	8	19

\*The gross tertiary enrollment rate is calculated by dividing the total number of students enrolled at the tertiary level (regardless of age) by the population of the age group that should be enrolled at that level at the start of the academic year.

Source: World Bank, *World Development Indicators*, 2005.

**Education Gains in BRICS**

Education is instrumental to economic growth and social stability. The returns to education in the form of income are well documented. Educational attainment is directly linked to income. In the United States, workers gain 4–6% of income for every year of college, even if they never graduate. Education can change the entire fortune of a nation. For example, India a relative laggard in the global economy until the 1980s is one of the rising stars in the global economy today thanks to the growth of the service sector that taps into a highly educated labor force.

**In the Next Decade****BRIC Consumption Patterns Will Set Standards for Global Companies**

As BRIC economies grow rapidly, more people in each country will be able to reap the fruits of economic development and join the ranks of the middle class. Economic mobility will be further accelerated by the investment in education. There will also be an emergence of a small number of elites. This would all mean that the BRIC nations will become important “sweet spots” for global spending in the near future. However, as income inequalities grow and large numbers of rural poor flood into urban areas, a large and mobile underclass (estimated to be up to one-third of the global population by 2050), will set its own consumption standards, very different from that of urban economic elites.

**Household Resources Will Be Reallocated**

Declining fertility rates, increasing divorce rates, and a rise in age of first marriage will mean that the average household will become smaller, leading to reallocation of household resources. And fewer mouths to feed means there will be more disposable income available to spend on non-essential luxury items. In particular, individuals will spend more on themselves as they resequence their life stages, on things such as adult learning, beauty and self-improvement, and travel.

**Social Unrest and Instability Will Rise**

Globalization will continue to drive gains in income for all, but the wealthy will also continue to take a larger share, increasing income inequality. Social differentiation will become more apparent as the rural poor move to new megacities, rubbing shoulders with the urban middle class and the elites. This will likely lead to social unrest and violence, as well as to economic and political instability.



#### 4. VIRTUAL MOBILITY | Cyberspace fosters novel forms of global mobilities for the masses

Virtual mobility is the ability to project oneself through telecommunications to interact with and influence people remotely. It makes it possible for people to connect with information and ideas from multiple sources, and enables them to create and maintain social relations across geographic boundaries and beyond traditional circles of influence.

In the heady early days of Internet, there was a fascination with new forms of mobility enabled by the disembodiment of cyberspace. Webcams promised the ability to “travel” to remote sites virtually, and online shopping created a global mall stocked with hundreds of millions of products. It was tempting to think that telecommunications had finally succeeded in overcoming what Frances Cairncross, editor at *The Economist*, dubbed “the tyranny of geography.”

What we know today is that the relationship between cyberspace and physical space is far more inter-twined and complex. For every virtual bit that is transmitted across the room or the globe, an equal number of physical atoms are mobilized. People visit distant e-mail acquaintances, producers ship goods to online customers in far-away markets, and digital media are made “real” on DVDs, iPods, and photo paper.

The importance of virtual mobility can’t be underestimated in the developed economies of BRIC. The Internet and mobile phones are far more widely available in India and China than the tools of other dimensions of mobility: private cars (physical), migration opportunities (residential) or better jobs or education (social and economic). They offer a way around, a way to get some of the benefits of other forms of mobility, without waiting and at reduced cost.

**Mobile Phone Adoption Is Rapid Everywhere**

Mobile phone subscribers per 1,000 population

	1996	2000	2004
Japan	214	526	716
United States	163	388	617
United Kingdom	124	717	1021
Brazil	15	133	357
China	6	68	258
Russia	2	22	517
India	0	4	44

Source: World Bank, *World Development Indicators*, 2005.

**Bigger Gap for Internet Access**

Internet subscribers per 1,000 population

	1996	2000	2004
United States	167	439	630
Japan	44	300	587
United Kingdom	41	264	628
Brazil	5	29	120
Russia	3	20	111
China	0	18	73
India	0	5	32

Source: World Bank, *World Development Indicators*, 2005.

**Key Future Drivers****Widespread Diffusion of Mobile Phones**

Cheap, universal access to mobile communications improves social ties, coordinates activities, and improves the flow of information in markets, all of which are powerful enablers of innovation. With the exception of India, the sole laggard in

mobile phone diffusion, all of the countries we looked at are well on their way to nearly universal mobile phone ownership. Yet even India, with just 44 mobile lines per 1,000 people is catching up quickly. The mobile subscriber base in India grew at a 50% annual rate in 2005.

**Persistent Gap in Internet Access Between Developed and Developing Countries**

While the BRIC countries are catching up in terms of mobile phones, the gap for Internet access between the United Kingdom, United States, and Japan and the developing countries is much more apparent. In the developed economies, an average of two-thirds of the population actively uses the Internet. In the BRIC countries, it's still just one in ten. While the nature of Internet statistics masks some of the access-sharing schemes

that enable a broader base of the population in BRIC countries to get online, these discrepancies are only a minor impact on the enormous gap between the haves and have-nots.



### Continued Gap in Broadband Access Between Developed and Developing Countries

In the United States, United Kingdom, and Japan, more than 50% of homes are currently served by broadband. In the BRIC countries, broadband access is limited to wealthy urban neighborhoods. While DSL is often available in the affluent districts of Shanghai, Sao Paulo, Bangalore, and Moscow, the lack of modern, extensive telephone and cable TV infrastructure is slowing widespread deployment in the BRIC countries. Outside major cities, it remains difficult to obtain basic telephone service, let alone broadband Internet access.

### Growth in International Connectivity

The great value of the Internet has been in its ability to foster grassroots globalization: the child in Thailand viewing online lectures from MIT, or the Zapatistas promoting their plight from the back country of Chiapas in southern Mexico. For virtual mobility, the ability to move bits in and out of a country is as important as being able to find a seat on a 747 is to physical mobility. Yet for the BRIC countries, international bandwidth capacity serves just a tiny fraction of what will eventually be needed.

### In the Next Decade

#### The Mobile Phone Will Become the De Facto Network Computer for BRIC

The rapid mobile phone adoption and slower growth of the desktop Internet and broadband infrastructure in the BRIC countries suggest a future computing environment that diverges from the PC-based style of the developed world. While Internet penetration continues to grow rapidly in BRIC countries, it may be decades before they achieve the PC/Internet density of the developed countries. For most of the world's population, the mobile phone will be the dominant engine of virtual mobility in the next decade, spurring the development of new services and support infrastructure to enable widespread, mass mobile network computing.

#### New Web Cultures: Virtual China and Virtual India

As IFTF's research on the future of China's Internet (<http://www.virtual-china.org>) shows, as cybercultures develop in emerging economies they will not be replicas of those pioneered in the West. Rather, new "species" of Internet cultures will emerge at the intersection of large, traditional cultures in the BRIC nations. "Virtual China" represents the first major diverging branch of Internet evolution, developing its own lingual, social, legal, and even technical norms that differ from the status quo. "Virtual India" and others are likely to follow suit, creating new zones of experimentation and innovation, but threatening the global unity of the Web at the same time.

### Broadband Is Unevenly Available

Broadband subscribers per 1,000 population

	2001	2002	2003	2004
United States	45	69	97	129
Japan	30	71	108	146
United Kingdom	8	31	54	103
Brazil	2	4	7	12
China	0	2	11	17
Russia	n/a	0	1	n/a
India	0	0	0	1

Source: World Bank, *World Development Indicators*, 2005.

### United Kingdom and United States Are the Hubs for Global Internet Routes

International Internet capacity [Mbps] per 100,000 persons, 2004

United Kingdom	910
United States	248
Japan	65
Brazil	11
Russia	7
China	1
India	<1

Source: Telegeography

**Broadband Cities, Narrowband Hinterlands**

The rapidly growing urban–rural divide in income, political power, education, and health care is already sparking civil unrest across the BRIC nations, most clearly in China and Brazil. The explosion of virtual mobility is enhancing the productive and innovative capacity of cities by speeding the flow of ideas and information, and supporting vital ad hoc social networks to form in these new communities.

However, the economics of deploying broadband (both wired and wireless) will continue to favor wealthy, dense, global cities at the expense of rural areas. The gap is likely to widen before it narrows, resulting in a landscape of broadband cities surrounded by narrowband or even disconnected hinterlands. While this situation is already spawning new innovative techniques to economically connect rural areas—solar-powered Wi-Fi repeaters, mesh networks, lightweight satellite transceivers, and broadband cooperatives—such approaches are proving difficult to scale fast enough to keep up with private-sector improvements to major city telecom grids.

**Virtual Communication Choke Points Will Emerge**

As Tom Friedman argues in *The World Is Flat*, the fiber boom of the 1990s left in its wake an enormous glut of cheap international telecommunications capacity, shrinking the distance between continents, and bringing places like Bangalore “virtually close” to companies and consumers in the developed world.

However, over the next decade, we will rapidly see this excess capacity exhausted as the movement of data and communications offshore from developed countries increases, and more bandwidth-intensive forms of communication such as video and immersive media become more widely used in developing countries. Just as Mumbai’s ancient airport and Los Angeles’ congested seaport have become choke points to physical mobility, we’ll see new virtual choke points emerge as BRIC countries outgrow the international fiber networks deployed over the last decade. Significant new investment will need to be mobilized well in advance of the market demand for these technically and financially complex infrastructure projects.





## 5. FINANCIAL MOBILITY | Global capital shares the stage with bottom-up and shadow economies

Financial mobility measures the ability for companies, individuals, and even criminals to move money into, out of, and around a nation's economy. It is one significant indicator of an economy's openness and a society's fluidity.

We still talk about the global economy as something that is largely run by multinational corporations. This was true in the 1980s and 1990s as economic liberalization reduced the role of national governments in setting the terms of trade. Yet over the last decade, new mobilities are helping rewrite the international financial landscape. Fueled by global labor migrations and stronger digitally enabled social ties between migrants and their families back home, remittance flows to the developing nations by emigrant workers now rival foreign direct investment (FDI) and international development aid in some countries such as Mexico and the Philippines. While much harder to measure, the global criminal economy is enjoying all of the new global financial mobilities pioneered by legitimate business over the last 25 years. In the future, corporations will increasingly be sharing the pie with grassroots communities and the underworld.

### Key Future Drivers

#### Rising Challenges to China's FDI Dominance

Investment in foreign economies expanded rapidly at the end of the 1990s as investors, flush with cash and emboldened by global economic health, sought high-yield opportunities. However, with the post-2000 cooling, overall FDI is significantly down from its bubble peak in several countries.

The story in foreign investment for the last decade has been China, China, China. However, while China is still the developing world's single largest recipient of foreign investment and continues a 15-year expansion of FDI, Russia, India, and Brazil are starting to appeal to foreign investors as well. Foreign investment will increase these nations' capacity to develop competitive and innovative industries in the same fashion as China.

#### The Flow of Global Capital Stagnates

Net inward FDI flows [current USD]

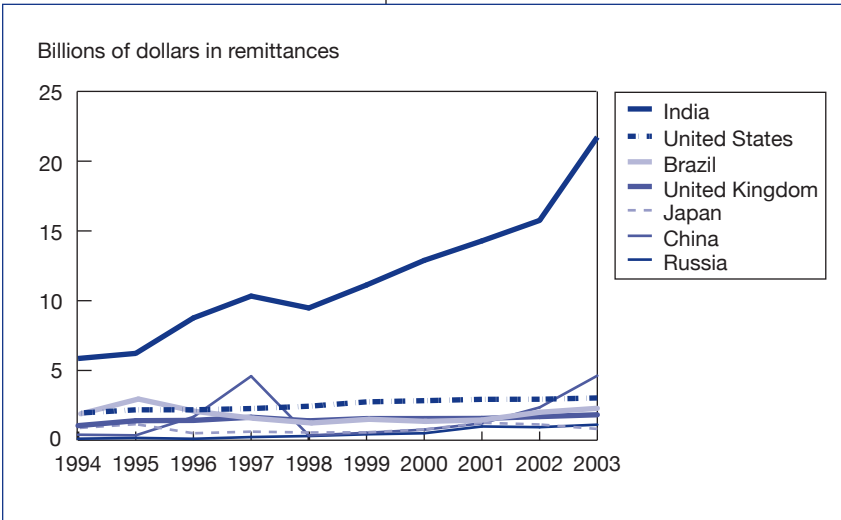
	1996	2000	2004
United States	87	321	107
United Kingdom	27	122	73
China	40	38	55
Brazil	11	33	18
Russia	3	3	12
India	2	4	5
Japan	0	8	8

Source: World Bank, *World Development Indicators*, 2005.

**The Flow of Workers' Earnings Expands**

**Growth of the Global Grassroots Economy**

Traditionally, economists have ignored the impact of remittance flows on developing economies. For much of the 20th century, these flows were too small or irregular to merit a great deal of scrutiny.



Today, however, remittance flows are large and growing much faster than the global economy. They are now a major force for growth and development, and rival formal development aid and FDI in some countries. India was the number one receiving country of migrant remittances in 2003, at over \$21 billion.

**Explosion of Consumer Credit**

The use of credit cards, a major vehicle for financial mobility in developed economies, is on the rise in BRIC nations. In China alone the number of credit cards in circulation is growing at a crackling pace,

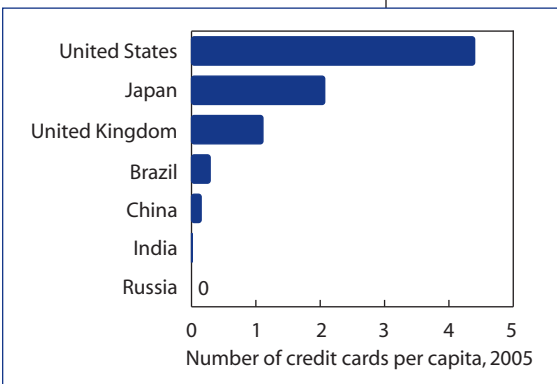
Source: United Nations Conference on Trade and Development, 2005 Handbook of Statistics.

from a little less than 100 million in 1997 to over 750 million in 2004. But unlike the developed countries where the amount of money people are borrowing on credit cards is causing consternation to consumer groups and debt counselors, people in the BRIC countries are less willing to borrow on cards and pay high interest.

**Consumer Credit Is Being Introduced to the BRIC Nations**

**A Growing Criminal Economy**

Perhaps one of the most elusive forms of financial mobility is illegitimate flows of money through criminal syndicates. International criminal organizations have widely co-opted the global infrastructure for moving people, goods, information and wealth. Between 1990 and 2005, legitimate global trade roughly doubled from \$5 trillion to \$10 trillion annually. But during that same period, the estimated volume of money laundering expanded tenfold to \$1.5 trillion annually.



Source: The Economist, "Making advances," January 12, 2006; Banco Central do Brasil; China People's Daily; Japan Consumer Credit Industry Association.



According to the Institute for International Economics, in the U.S. money launderers only face a 5% chance of being convicted in any given year. Elsewhere, where regulations are less strict and enforcement weaker, the rate is even lower. A study by the Australian Institute of Criminology named the United States as the world's leading source of laundered money, as profits from the sale of narcotics are moved to offshore accounts.

### In the Next Decade

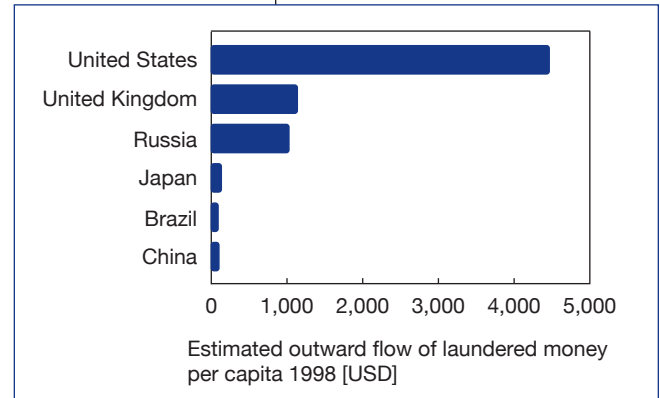
#### New Sources and Directions for Foreign Investment Will Emerge

For the last decade, China has dominated the attention of investors in emerging markets. While China's economy is still strong, and has good prospects for growth, increasing opportunities will draw a larger share of overall FDI to India, Brazil, and Russia. The scope of this shift will depend upon the overall stability and pace of financial and legal reforms in these sometimes troubled economies. A second major trend over the next decade will be an increase in FDI flows *between* developing countries. Chinese and Indian firms are both beginning to make major investments in the Middle East and Africa. Although the bulk of the foreign investment flows from one developed economy to another, the share being sent to developing countries is increasing substantially. Chinese banks in particular are urgently seeking opportunities to invest their large and growing foreign reserves. Recent moves into African energy and infrastructure projects are merely the first wave of this trend.

#### Remittance Flows Will Create New Markets and Transnational Consumer Identities

Over the next decade, remittances will continue a robust and rapid expansion as migrant communities grow and climb up the economic ladder in their adopted homes. These decentralized flows will create new market opportunities in the receiving countries where disposable incomes will rise and consumers will be able to increase spending on long-term purchases like vehicles and homes. Remittances will also shape a new kind of transnational consumer—remittance communities will increasingly remix values from both the sending and receiving cultures.

### The United States and Russia Export Record Levels of Laundered Money



Source: John Walker, Australian Institute of Criminology

**The Criminal Economy Will Be a Drain on Growth, and a Source of Innovation**

Representing a rapidly growing share of global financial flows, the criminal economy threatens to de-legitimize governments and corporations, and destabilize markets over the next decade. In effect, these illicit activities will act as a tax on legitimate trade. However, as we've seen with file-sharing networks, "dark mobs" sometimes are powerful drivers of innovation. The entertainment industry's crack-down on file-sharing pirates has been a major catalyst for technical improvements in file-sharing software and network protocols. And now, the industry is beginning to benefit from these innovations. For example, Electronic Arts now uses BitTorrent—the third generation of consumer file-sharing software—to distribute game software far more efficiently than previous means.



## 6. EPHEMERAL MOBILITY | Opportunistic nomads gather for spiritual, recreational, and security reasons

Ephemeral mobility is the large-scale movement of groups of people on a temporary basis—be it a few days, months, or years. New physical and virtual mobilities are enabling more frequent, ad hoc, and socially coordinated forms of ephemeral mobility to emerge. For example, “smart mobs” and “flash mobs” combine mobile communications technologies and physical mobility to rapidly gather, act in concert, and dissipate groups of people. The built environment is being adapted to accommodate ephemeral mobility, with increasing investments in what might be called “temporary cities,” resorts, airports, cafés, and convention and meeting centers, for example. Ephemeral mobility depends on lightweight technologies and infrastructures—more specifically, the ability to assemble and disassemble resources on the fly. As such, ephemeral mobility is a key driver for innovations in infrastructure design and tools.

### Key Future Drivers

#### Growth in Tourism

Temporary movements for tourism are the dominant form of ephemeral mobility in the seven study countries. During Japan’s economic expansion in the 1970s and 1980s, wealthy Japanese tourists became a familiar sight in popular destinations such as Hawaii, Paris, and New York. Today, that role is being supplanted by Chinese overseas tourists, who are doubling in number every four years. In the future, we will likely see Indians abroad for leisure in rapidly growing numbers as well. On the flip side of tourism, destinations like China and Russia are becoming more popular.

### China Is Emerging as a Major International Tourist Destination

Millions of international tourist arrivals

	1996	2004
United States	47	46
United Kingdom	25	28
China	23	42
Russia	16	22
Japan	4	6
Brazil	3	5
India	2	3*

\* Data is for 2003.

Source: World Bank, *World Development Indicators*, 2005.

### More Countries Are Attracting International Students

Thousands of resident international university students

	1999	2000	2001	2002	2003	2004
United States	452	–	475	583	586	573
United Kingdom	233	223	226	227	255	300
Japan	57	57	64	75	87	117
Brazil	–	–	–	1	1	–
Russia	41		64	71	69	76
India	–	7	8	8	8	8
China	–	–	–	–	–	–

Source: UNESCO Institute for Statistics

### Forced Migrations Are a Demographic Fact for All But A Few Nations

Thousands of people in the population of concern: refugees, asylum seekers, internally displaced persons

	1997	2004
Russia	1,622	665
United States	1,024	685
China	292	299
India	223	163
United Kingdom	160	299
Japan	5	2
Brazil	2	3

Source: United Nations High Commissioner for Refugees

### From Brain Drain to Brain Circulation

The United States and United Kingdom have long been the leading destinations for students from other countries. And as often as not, in the past these migrations were

often one-way: foreign students would work in their adopted country after graduation and eventually establish families there. However, that “brain drain” is now increasingly “brain circulation” as students and young professionals, from China and India, especially, return home sooner after graduation. Once a form of residential mobility, the movement of international students is now ephemeral. Furthermore, the range of destinations is broadening—the United States no longer dominates in the post-9/11 era—universities in New Zealand, Australia, and the United Kingdom are marketing themselves aggressively to prospective students in China and India and are seeing increases in the numbers of their international student populations.

### Increasing Numbers Forced to Move

The darker side of ephemeral mobility is forced or involuntary migrations. Forced migrations are driven by a variety of natural and man-made events. In 2005, the world saw major forced migrations from ethnic cleansing in the Darfur area of Sudan, natural disasters in Indonesia and Pakistan, and civil wars in Congo, Liberia, and other African nations. Hurricane Katrina displaced some 1.5 million people, many permanently. This was the largest forced migration of Americans in 150 years.

The seven nations form a spectrum—at the one end are countries that are global havens for refugees (United States, United Kingdom) and at the other nations that are among the largest senders (Russia, China). In between are countries that are largely isolated from international flow of refugees and asylum-seekers. The United States and the United Kingdom are among the most welcoming to refugees, and nearly 1 million displaced persons are re-settled in those countries today. India is also a large recipient of regional refugees from Bangladesh and Nepal. Russia and China have seen a large flux of refugees across their borders with unstable neighboring states in Central Asia and the Korean Peninsula. Japan and Brazil are largely outside the international flow of refugees.



In general, the trend across these countries is a declining flow of refugees—as economic growth brings greater stability, regional and ethnic conflicts are being reduced and communities are more resilient in response to natural disasters. The exceptions are China and India, which are exporting a small but growing number of refugees, and the United Kingdom which is a rapidly growing haven for asylum seekers.

### In the Next Decade

#### The Changing Face of Global Tourism

Tourism is changing rapidly as new physical, financial, and economic mobilities drive leisure travel. As a result, more and more destinations are witnessing a rapid change in the face of global tourism—fewer Japanese and Americans, and more Chinese and Europeans. The reasons are many and complex, but a few keys drivers are likely to remain important over the next decade, including: growing disposable income among the Chinese middle class; weakness of the U.S. dollar, raising overseas travel costs for Americans, and making America an attractive destination; aging of the population and continued economic insecurity in Japan; and regional integration in Europe and Asia due to low-cost, intra-regional air travel.

#### Tourism Will Become More Personal, Experiential, and Information-Rich

Tourism has always been about gaining knowledge and experience—by visiting historical sites, interacting with locals, and experimenting with new languages and cultures. Going forward, this aspect of tourism will increase as technological tools make it easier to understand and navigate new places, and locate meaningful information and social experiences. Just as magnets for migration cultivate innovation through mixing, tourism and ephemeral mobility will be vital ingredients to creating serendipitous, stimulating milieus for innovation, integrating new types of information and technology tools into mobile experiences.

#### Disasters Will Drive Innovation in Lightweight Infrastructure

Recent disasters have shown how new technologies and capacities for mobility are increasing the ability of communities to self-organize in response to crisis. As urbanization exposes growing populations to more frequent natural and man-made disasters, we will develop a greater ability to quickly re-establish displaced persons and communities. This ability will arise out of new ways of organizing lightweight infrastructure components and new forms of cooperation that maximize their capability. While these populations will be at greater risk, they’ll also be developing ways to be more flexible, adaptive, and resilient in the face of crisis.

#### Declining Flow of Refugees from Most Countries

Number of refugees leaving the country		
	1996	2004
Russia	173,723	107,967
China	105,810	134,724
India	7,550	13,345
United States	130	232
Brazil	46	353
United Kingdom	28	55
Japan	–	–

Source: United Nations High Commissioner for Refugees

### 3 | MOBILITY EXPLOSION: KEY OPPORTUNITIES

In the coming decade, more people, goods, and money will be in motion, and a swarm of information will accompany them helping to manage these complex and tightly coordinated flows. As sociologist John Urry argues in his recent book *Sociology Beyond Societies: Mobilities for the Twenty-First Century*, we're moving from a world in which society is the organizing concept and shaper of trends to one in which mobilities and flows define our human world. And not only the volumes of different types of mobility will grow, in many cases fueled by rapid economic development in BRIC countries, but the increases in mobility will take place under extreme conditions.

In BRIC and other rapidly developing countries, the personal physical mobility explosion will often overwhelm the infrastructure meant to accommodate it. While the infrastructure needed to suit expanding personal mobility needs in developed countries evolved over a century, it is sorely underdeveloped or lacking in developing countries. We already see examples of this gap in many urban centers in India and China, where rising incomes are enabling car ownership in areas with no or extremely poor roads. A picture of a congested intersection in India where cars share roads with bicycles, scooters, pedestrians, and cows and where there are no traffic lights, is a perfect example of this.

What does the mobility explosion mean for companies? IFTF has identified three opportunity zones for companies to focus on: segmentation, rethinking assumptions, and focusing on less-affluent mobile populations.

#### Explore Segmentation Based on Mobility Patterns

As we move from a world in which society is the organizing concept and shaper of trends to one in which mobilities and flows define our human world, we need to re-think the lenses we use to understanding this new world.

Segmentation has been a powerful lens for organizations to understand their markets. But traditional market segments are based on demographics or psychographics, categories that are becoming too fluid and much less useful in light of increasing mobility in so many areas. If flows and mobilities will define markets in the next ten years, shaping tastes and preferences, and giving rise to and enabling the diffusion of ideas, it becomes much more relevant to segment markets on these flows. For example, one might segment on individual cities or urban areas with similar mobility patterns, instead of looking at the city's demographic characteristics.





In the case of consumers, companies can consider segmenting along the mobility dimensions outlined in this report—physical, virtual, ephemeral, and others. For example, we are seeing the emergence of a class of global elites whose tastes and preferences cross geographic boundaries. These people have similar mobility patterns—most of them drive personal cars, visit similar tourist destinations, and display similar patterns of work-related travel. These people have many similar needs that are rooted in their mobility patterns that will likely create distinct markets.

### **Design for Mobility by Re-Thinking Assumptions**

Today personal mobility is up for grabs as new forms emerge and familiar old paradigms like the automobile mutate. Companies need to rethink their old assumptions in light of new consumer practices that affect the design of existing products. One example is the changing way in which mobile consumers view the concepts of ownership and sharing.

In the developed world, while ownership will remain a primary source of consumer satisfaction for the foreseeable future, we see the door opening for new business models that create value through convenience and on-demand access, but make money by pooling and sharing resources. For the most highly mobile, ownership will increasingly represent an undesired anchor to specific people, places, and institutions that limit freedom and flexibility. For these highly mobile, highly networked groups, technologies for cooperation will enable new combinations of commitment and ownership that serve as alternatives to the traditional models.

### **Understand the Needs of Non-Affluent Highly Mobile Populations**

We often think of mobility as the preserve of affluent, educated, privileged classes—those who can afford to travel for leisure or work, for example. However, in the world of increasing mobility, highly mobile populations include large numbers of poor. These are poor migrants moving into urban areas; those at the lower socioeconomic level taking to the skies for the first time; or those forced to become mobile as a result of environmental disturbances. These are groups that are not currently viewed by companies as their customers and yet as a group, their needs will create new markets.

Succeeding in such markets, however, will require new ways of thinking. Muhammad Yunus, Nobel Prize winner and pioneer of micro-lending, enabled the creation of new consumer populations among the poor, those who had not been viewed as potential consumers for financial services. His efforts began with asking a woman beggar he encountered on his daily walk: “What do you need to get you out of poverty?” This is a good question for companies to start asking. But companies will need to identify other new questions to ask themselves of the poor and their new found mobilities.





## ABOUT THE ...

### Technology Horizons Program

The Technology Horizons Program combines a deep understanding of technology and societal forces to identify and evaluate discontinuities and innovations in the next three to ten years. We help organizations develop insights and strategic tools to better position themselves for the future. Our approach to technology forecasting is unique—we put humans in the middle of our forecasts. Understanding humans as consumers, workers, householders, and community members allows IFTF to help companies look beyond technical feasibility to identify the value in new technologies, forecast adoption and diffusion patterns, and discover new market opportunities and threats.

### The Institute for the Future

The Institute for the Future is an independent, nonprofit strategic research group with nearly 40 years of forecasting experience. The core of our work is identifying emerging trends and discontinuities that will transform global society and the global marketplace. We provide our members with insights into business strategy, design process, innovation, and social dilemmas. Our research generates the foresight needed to create insights that lead to action. Our research spans a broad territory of deeply transformative trends, from health and health care to technology, the workplace, and human identity. The Institute for the Future is located in Palo Alto, California.

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