

Innovation in the Urban Wilderness: lightweight infrastructure meets cooperative strategy

Technology Horizons Program | SR 1050

1 | CRUCIBLES FOR NEW URBAN LIFESTYLES

Every day brings new evidence of the planet's urban transformation. Economic globalization and a demographic explosion have combined to destabilize the agricultural countryside of the developing world and drive millions into cities in search of work. The very notion of the city as we know it is changing, as poverty and slums are manufactured on a staggering scale—as author Robert Neuwirth points out, squatters are the world's biggest consumers of concrete and steel. The future seems bleak for the world's 1 billion slum-dwellers who lack sufficient housing, nutrition, health care, and education. And this demographic transformation to a world of cities is only halfway complete: by the time it has run its course in 2050, one of every three people worldwide will be living in a slum.

But there are reasons for hope in the world's slums, as these extreme environments are creating crucibles for innovation. While multiple forces threaten to destabilize these newest and largest cities, they are also driving adaptations that combine new technologies and new forms of organization. The outcomes are often counter-intuitive: in Kenya today only 600,000 households have electricity, but there are over 6 million mobile phones in use.

Lightweight information and communications technologies like mobile phones will be the key tool in the struggle for survival in the slums of the 21st-century megacities. They are being deeply intertwined with new grassroots models for social and economic cooperation. In a virtuous circle, these new cooperative models are enablers as well as outcomes of lightweight infrastructure. They are forging a powerful symbiotic relationship with the outputs of science and engineering R&D.

But why should companies care what happens in the slums of the third world?

Put simply, these places will become critically important incubators of new lifestyles, technological practices, and business models. While outsiders see isolated, poverty-stricken, Dickensian slums, today's squatter communities are actually bustling with commerce and entrepreneurial activity. Places like Nairobi's Kibera district are growing in an economic and technological context of digitalization and globalization that offer opportunities and outlets that the slums of Western cities never had at their height. Surely they are environments of unprecedented challenges for survival, but like the slums of the 19th century their problems will drive fundamental innovations in everything from medicine to architecture and governance. They will be a source of bold, fresh ideas for the developed world where incremental innovation has become the norm.

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UNDERSTANDING THE NEW URBAN LANDSCAPE

This memo, *Innovation in the Urban Wilderness: Lightweight Infrastructure Meets Cooperative Strategies* (SR-1050) describes a new landscape of grassroots urban innovation that is solving local problems by combining new strategies for cooperation and new lightweight technologies for moving and processing people, information, and materials.

Cooperative strategies are at the core of how human communities have thrived historically. In fact, research suggests that it was our need to communicate complex social information that drove the rapid expansions of brain capacity between *Homo sapiens* and earlier species of humanoids. However, two centuries of neoclassical economics as a dominant paradigm in business have elevated competition as the main source of strategic advantage, and relegated cooperative strategies to the background. Today, we are gaining a better understanding of these very natural and widely used strategies.

Lightweight infrastructure is a broad category of technologies that are enabling us to build networks for moving people, processing goods, and communicating and sharing information that are very different in scale and function from the industrial infrastructures of the 20th century. Where 20th-century networks were built upon simple materials like steel, concrete, and copper, lightweight networks utilize smarter, more dynamic substrates: nanomaterials, frequency-shifting radios, and increasingly complex bioengineered substances. In terms of scale, 20th-century network infrastructure was regional or even national in scope—tomorrow’s lightweight networks deliberately serve very small user bases, but interconnect in smart ways to create large distribution grids. In a sense, lightweight infrastructure is a return to small-scale production and consumption of the pre-industrial age, but employing all of the technological advantages of industrial engineering. Instead of the well or reservoir, a portable desalinization device. Instead of the hearth or power plant, a backyard fuel cell or a hand-cranked generator (see Table 1). (For more characteristics of lightweight infrastructure, see text box, “Recognizing Lightweight Infrastructure” on page 4.)

Table 1
Heavy Versus Lightweight
Infrastructure

	Heavy	Lightweight
Telecommunications	Telephone network	Voice over IP
Electric power generation	Coal-fired power plant	Portable fuel cells
Water purification	Sewage treatment plant	Seldon water stick
Manufacturing	Injection molding	3-D printing
Banking	Bank branch office	Mobile phone payments
Air transportation	Hub-and-spoke networks	Point-to-point air taxis

Source: Institute for the Future



INNOVATION IN THE URBAN WILDERNESS

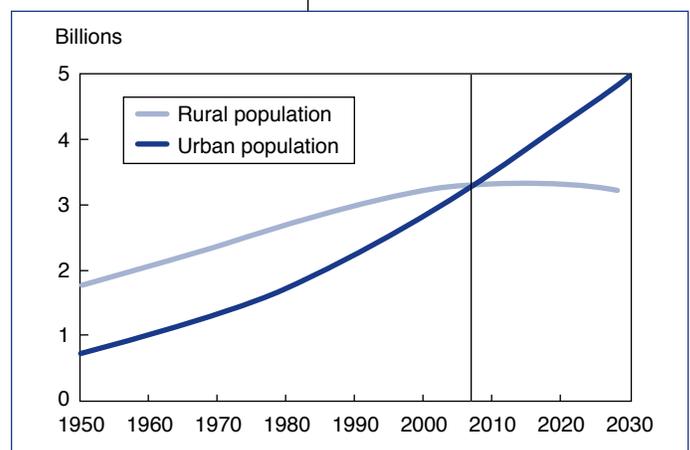
This decade, as the urban population surpasses the 50% threshold worldwide, rapidly growing cities will face unprecedented challenges in managing wealth, health, infrastructure, and social discontent (see Figure 1). In our *2006 Map of the Decade*, we forecast an expansion of these “urban wilderness” areas—places where economic instability, environmental disaster, and social and political breakdown combine to create barren conditions hostile to the human species. We forecast that these regions could devolve into unmanageable “feral” cities, rife with chaos and lawlessness and lacking governance structures that address the basic needs of residents.

But we also see the urban wilderness to be an increasingly important source of innovative social and economic practices organized around lightweight technology. Indeed, the urban wilderness could be an important arena for pioneering flexible infrastructures of all kinds that provide widespread benefits across regions and socioeconomic class.

A few authors have begun to document this shift. To urbanists and housing specialists like Solomon Benjamin, slum neighborhoods are hot beds of activity and innovation. These neighborhoods are centers of small-firm clusters that interlock in a pattern of inputs and outputs and flexible resource regimes. We’ve seen this emerge spontaneously in places like Chongqing, China where loosely coupled networks of small firms have captured 50% of the world’s motorcycle market in just a few years. As John Hagel and John Seeley Brown describe in *The Only Sustainable Edge*, these producer networks were able to rapidly improve quality and drive down the cost of production by maintaining a high level of sustained innovation and improvement in process.

Thus, rather than viewing “urban wilderness” as a passing phase in the development process, organizations should view them as a consistent self-sustaining and vibrant part of the economic landscape of the future. Understanding innovations arising in these environments, becoming embedded in urban slum neighborhoods, and creating products and services that can become a part of the urban ecosystem, is the next big opportunity for companies. However, to be successful, they need to abandon assumptions and strategies that have worked in more affluent markets and developing new approaches to capitalize on opportunities in the urban wilderness.

Figure 1
Transition from Rural to Urban
(Global population)



Source: United Nations

Recognizing Lightweight Infrastructure

How do we know lightweight infrastructure when we see it? We have developed a set of characteristics that provide a useful checklist to help identify encounters with lightweight technologies.

- **Leverage new materials.** By exploiting novel properties of raw materials, lightweight hardware reduces the scale at which functions become economical or mobilize functions that used to be fixed. Example: The Seldon Water Stick, a portable device that employs a nanoscale mesh filter to purify water without electrical power.
- **Scale through networks.** Traditional infrastructures scale by increasing plant size—be it for producing electricity or treating waste. Lightweight systems leverage networks to distribute capacity, diffuse external shocks, and provide adaptive flexible avenues to scalability. Example: The BitTorrent peer-to-peer file sharing system performs better as it grows bigger and more computers are able to serve up pieces of large files.
- **Leverage focused disaggregation.** Instead of doing everything in one place, lightweight designs distribute tasks to inter-linking components: individual components are engineered to excel at a more narrowly focused task. Example: Linux, Apache, MySQL, and PHP make up a suite of highly-focused, modular software programs that runs much of the Web and has consistently outperformed integrated alternatives developed by Microsoft and others.
- **Originate as ad-hoc structures.** Lightweight infrastructures are often temporary—their flexibility allows them to be rapidly re-deployed based on changing needs. However, they often become institutionalized in place as they increasingly offer advantages over heavy infrastructure approaches. Example: Small gas turbines and solar sites put in place by companies concerned about business continuity after 9/11 are now becoming an important and permanent part of the larger power-generation infrastructure.
- **Are simple to use.** Lightweight infrastructures, because of their open network nature, are often self-documenting. Examples: The PDA designed for doctors in Uganda described later in this memo took only 1–2 days of training to master its basic functions. Most blog, wiki, and other social-software interfaces are template driven and use some sort of simple text editors, making it easy for first-time users to share information, make links, and build networks.
- **Use multiple-actor networks.** Heavy infrastructures are typically managed through top-down closed and hierarchical organizations—lightweight arrangements rely more heavily on peer-to-peer models that emphasize cooperation over coercion. Examples: Wikipedia depends on volunteer management and quality control through a distributed, peer-to-peer method of monitoring for abuse and correction of errors and damage. Open knowledge commons based on wikis and managed by distributed participants are springing up daily in the fields of health, finance, consumer activism, and governance.



2 | THE CROSSROADS OF LIGHTWEIGHT INFRASTRUCTURE AND COOPERATIVE STRATEGY

Lightweight infrastructure alone is a powerful enabler of change in any setting—it can bypass traditional chains of authority, reduce vulnerability of large hubs, and mobilize functions that were previously fixed in place. It can usher in social change, as it rewrites the rules of wealth, health, and power from the bottom up. However, the full potential of lightweight infrastructure is only realized when it is combined with new forms of cooperation to link up small, isolated groups of users and components into larger networked structures. The current shift in urban renewal strategies from relocation and redevelopment to regeneration may promise to do just that. After years of failure of top-down slum clearance programs and oppressive economic growth plans, countries across the globe and international institutions like the World Bank are rapidly shifting to more sustainable, capacity-building strategies. Countless stories are documenting the capacity and drive of slum residents to self-organize as they recover from both man-made and natural disasters.

As lightweight infrastructure, cooperative strategies, and recognition of the self-organizing drive of squatters converge, they are forging a new platform for organizing and mobilizing resources in the world's slums.

The emerging interdisciplinary of cooperation is creating a new strategic toolkit that shows much promise for helping reframe complex social and economic problems that traditional economic theory and social structures are struggling with today. The field benefits from insights from many disciplines—mathematics, sociology, economics, biology, political science to name a few—and offers a new lens on resource management and production, value creation, human motivation, and organizational (and systemic) learning. (See *A New Literacy of Cooperation for Business* [SR-851A] for more detail.) The following lessons from cooperation are among the most important for catalyzing innovation already occurring in the urban wilderness and focusing that energy toward mounting urban problems.

SHARED RESOURCES CAN CREATE WEALTH

Cooperative strategies demonstrate that public goods or common-pool resources (owned by no single entity but used by many) can be successfully managed to create wealth for individuals and for larger publics. As Elinor Ostrom has shown, it is possible to develop institutions for collective management and maintenance of common-pool resources, providing an alternative to private property. Her list of criteria for such institutions provides guidelines for identifying the barriers and enablers to successful common-pool resources that could provide the necessary rights that slum dwellers need to invest and create new assets.

Urban squatters are considered illegal residents and unofficial in most cities because they don't have title or any official form of owning their land. Many have argued that squatter communities should be formalized by granting title to inhabitants. The argument is, that by gaining ownership, squatters would increase investment in their homes, accumulate wealth and the means to improve their own communities. But as Robert Neuwirth shows in *Shadow Cities*, his book about time spent living in four squatter communities around the world, granting title to individuals in squatter communities often sets off destructive waves of land speculation as outsiders exploit the poor to assemble larger tracts for redevelopment. Neuwirth illustrates how in slums where families can secure rights to improve those properties as well as long-term tenancy rather than outright ownership of land, uncertainty is reduced enough to stimulate investment and upgrading. This approach also preserves the sense of community and shared ownership of the land that is such a successful cooperative survival strategy for squatters.

SUPPORTING CHOICE UNLOCKS LOCAL EXPERTISE

Slum dwellers are experts in creating value out of minimal resources and in constrained political, environmental, and economic conditions. Yet their expertise is rarely elevated to the level of blue ribbon panels and academic credentialed committees. Lead-user innovation models in the consumer product and service domains have the potential to reverse this pattern and integrate experts in squatter strategies into more participatory processes of urban regeneration.

Recent thinking in innovation process is demonstrating successful volunteerism and contribution to commons-based goals benefit from allowing individuals to identify how they contribute. Open-source projects don't generally assign tasks; they rely on motivated individuals to pick their own tasks. This draws on individual passions, sense of craft, greed, and desire for status and reputation, among many other motivators. It also reveals the range and scope of local expertise and experience in a network, which may not have been known otherwise.

Pioneered by MIT professor Eric Von Hippel, author of *Democratized Innovation*, lead users are those whose profiles don't fit the average or mass market. They take products and services to the edge. They break and bend them to fit new contexts and new purposes. They integrate them with other products and services providing new perspectives, experiences, and experiments that traditional consumer research could not provide. Involving lead users in participatory design and problem-solving processes opens up the opportunity to learn from the tacit knowledge of lead users—the indefinable knowledge that comes from personal practice and experience—and incorporate it into the innovation process. In doing so, leading-edge users provide insight about next-generation offerings or what entirely new product categories may look like.



Viewed as lead users of emerging urban forms, not to mention key change agents in their communities, squatters and residents of the urban wilderness will become increasingly important in the design and direction of urban regeneration. But this local expertise will not be tapped unless residents of the urban wilderness can participate in meaningful, self-fulfilling ways.

LEVERAGING SELF-INTEREST BENEFITS COLLECTIVE GOOD

Cooperation isn't really about altruism, but about deep self-interest—building a structure so that self-interest adds up to something more for everyone. eBay ratings work this way when buyers and sellers rate each other and those ratings collectively represent trustworthiness. The Google page-rank algorithm works this way when individuals make a link to a Web page and they get aggregated into a search rank. Open-source software and Creative Commons licenses work this way when more people continue to develop applications and build off of creative cultural works. They have turned free-riding into a benefit for the larger community.



Seller rating



eBay, ratings translate to trust

3 | SIX DIRECTIONS OF LIGHTWEIGHT COOPERATION IN THE URBAN WILDERNESS

For most of history, cities have dealt with slums in one of two ways—ignoring them or eradicating them. But in today’s megacities, local authorities lack the resources to effectively redevelop or even eradicate slums, and the historically unprecedented size of the problem makes it impossible to ignore. As Sheela Patel, founder of Mumbai’s Society for the Promotion of Area Resource Centers summed up the situation: “most cities in the South are as poor as the people that live in them.” She ought to know, as she helped pioneer the lightweight cooperative approach to slum redevelopment 20 years ago, by organizing women into savings clubs and housing investment collectives. The lightweight technologies of 1985 were bulletin boards that used pictograms so they could be understood by uneducated, illiterate women.

Today, lightweight technologies are proliferating, while the cooperative strategies remain the same. However, what is changing is the number of informal groups and NGOs that can leverage those technologies for their own home-grown cooperative efforts. As the World Bank’s Lead Economist for Transportation and Urban Development, Robert Buckley has stated “something that is new is the emergence of lots of viable, local, bottom-up, self-help organizations in slums.”

Today, there is a growing recognition in the international development community that the only effective solutions to the slum problem will need to be driven from within. Put simply, the innovative potential of squatter communities is only now beginning to be broadly recognized.

Here, we identify six emerging directions of this unique kind of slum innovation. These examples suggest future directions for innovation at the intersection of cooperative practices and lightweight infrastructures in the urban wilderness.

- **Regenerative commerce** is creating values-based business models that support sustainable growth.
- **Mobile learning networks** provide ultra-low cost mobile communications and portable computing that are changing the way children (and adults) learn.
- **Bottom-up health care** is reversing traditional flows of data in developing country health systems.
- **Micro-finance** provides new ways of sharing resources in nontraditional markets.
- **Dynamic transportation** creates new models of shared mobility.



- **Ad hoc disaster response** builds capacity to cope with crisis in areas where governments lack rapid-response capabilities.

REGENERATIVE COMMERCE

Regenerative commerce is a form of values based commerce that integrates social networks (and their values) with transactional networks to retain and grow local wealth. The term was coined by Jon Ramer, Executive Director of Interra, which is a pilot program that links local merchants into a cooperative network to sustain their own businesses and local community organizations and nonprofits. Merchant contribution and support for local community organizations become a new basis for attracting and retaining loyal consumers who value local business and organizations that benefit the community. Interra's goal, as Ramer describes, is to turn "value preferences into market choices." Regenerative commerce networks offer a new path to participatory economic development. It demonstrates how access to lightweight networking and values-based business models can encourage development models that support sustainability and broader collective benefits

Keeping Dollars in the Community: Viva Favela

Community business-to-business portals help regenerate communities by enabling businesses to source new contracts and materials locally. By providing a community a portal to the Web, telecenters provide a platform for self-governing *favelas* (shantytowns) to develop locally meaningful services. Two of the largest *favelas* of Rio de Janeiro, Rocinha and Mare, are able to gain new leverage in wholesale distribution networks from their new telecenter's Web portal as part of the Viva Rio project. The telecenters provide low cost Internet access, computer training, and the opportunity for residents to contribute to the community's Web portal. Rocinha and Mare don't have telephone lines, but Brazilian ISP, Taho, provides Internet connectivity based on radio wave technology from the Israeli military.

An offshoot of Viva Rio, Viva Cred, provides credit for purchases of computers for home use. While increasing personal connectivity and access to information, the new web portal catalyzed the small business and merchant networks. Merchants can collectively buy products wholesale on the Viva Favela portal, lowering their costs tremendously and saving *favela* residents money. The merchandise buying service is supported by Mercado Elettronico, a B2B Internet company that works with small and medium-sized businesses. Since most *favela* store owners pay cash for the products they are less at risk of default as they may be if they were using credit. Also, the credibility that comes from being collectively associated with the Viva Favela program adds to the store owner's reputation.

In addition to the merchant collective, the Viva Favela network program spawned a community radio network that is supported by community correspondents and local musicians.



**Interra, cooperative network
for local merchants**



Viva Favela, supporting self-governing favelas



Bioplaneta, facilitating social and technical network connections

An Inter-City Marketing Network for Women Micro-Entrepreneurs

In Tamil Nadu, India, organizers with India's Foundation of Occupational Development (FOOD) noted that while small, specialized cottage industries existed in every city in the region, they all relied upon middlemen to market their products outside of their own city. By leveraging mobile phones and SMS, FOOD created a network of 215 community-based organizations representing an average of 1,000 women micro-entrepreneurs each. Using SMS the co-ops in different cities act as marketing and distribution agents, instead of paying middlemen. The average middleman commission of 18% to 30% has been eliminated.

Ensuring Fairness: ifPeople

After witnessing the economic collapse of Argentina in 2001, the founders of ifPeople sought out ways to aggregate and recapture the economic drive of entrepreneurs in the country's urban centers. They developed ifPeople, a network of professional network service providers that uses FairSource business standards and practices to generate quality work at a fair wage. FairSource is a business model that provides an ethical means of outsourcing, designed to support micro-enterprises through fair trade. It creates relationships based on collaboration, defined standards of values, and quality. In essence, FairSource provides a code of conduct for the provider that rewards responsible business practice, while assuring the purchaser of the ethical and sustainable business practices used in providing the service. Because of the values inherent in the FairSource model, service provider members in ifPeople benefit from shared learning and professional development and opportunities to self-finance their growth and development.

Going Global Together: Bioplaneta

Micro-enterprises and personal businesses typically are at an infrastructural disadvantage—they lack access to networks that could help link them to suppliers, markets, and know-how from others that enable market presence, growth, and sustainability. Bioplaneta is an organization that facilitates social and technical network connections among small-scale producers in Oaxaca, Mexico. Bioplaneta provides technical assistance to small-scale producers and links them to NGOs so that they can reach the goals and requirements of an Eco-Solidarity distributor network.

Producer members are stakeholders in Bioplaneta and work collectively. They vote on structure and leadership of the network, buy inputs from each other to circulate capital, share investments in a fleet of trucks, and repay loans from the network to community development initiatives. These activities help retain capital and direct new capital into local communities—regenerating them from the inside out. While this is currently operating in rural Mexico, there is potential for similar networks to catalyze local urban producers in Mexico City's squatter communities. Emerging urban agriculture in Mexico's Federal District could become more far reaching with the network effects that Bioplaneta offers.



MOBILE LEARNING NETWORKS

Lightweight infrastructure is having its biggest impact on the urban wilderness through the rapid introduction of information and communications tools that support everyday research and learning. The industry's ability to rapidly open new markets and market new products has injected a growing supply of devices for computation and communication into even the most infrastructure compromised communities on the planet.

The cooperative nature of these platforms for everyday research and learning come to light in the areas where these tools are not serving a single user, but whole families, small and even entire communities. For it is in these places that cooperative structures to share access to the devices and information they provide are evolving rapidly in a very ad hoc, decentralized fashion. These structures bridge the gap between online networks and embedded, local social networks.

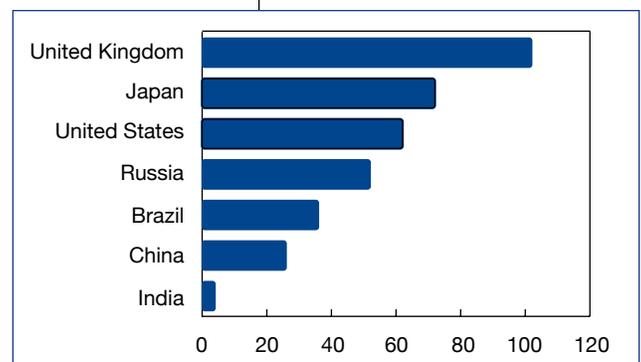
Networking the Poor: Mobile Phones as Social Tools

Mobile telephony provides an ideal lightweight alternative to traditional fixed-line telephone service for developing countries. In fact, the mobile phone has become a predominantly developing world technology—some 1.5 billion of the world's 2.5 billion mobile phone lines are in developing countries.

Mobile phones have quickly diffused throughout the developing world. Already at least one-quarter to one-third of the populations in Brazil and China have a mobile phone, and while lagging in per capita terms, India is rapidly gaining ground with a tenfold jump between 2000 and 2004 (see Figure 2). Within a decade, it is likely that most of the developing world will have achieved relative parity with the North in individual access to basic mobile voice communications—probably the only infrastructure where there will be a level playing field globally.

Mobile phones provide powerful tools to the urban poor. As Howard Rheingold described in his 2002 book *Smart Mobs* and has continued to document at www.smartmobs.com, mobile phones are superb enablers for sharing information about political issues, market prices, and social relationships. Illiteracy does not present a barrier to access. Moving forward, we'll see mobile phones expand to allow illiterate people to search and browse the Internet using voice commands. Today, the mobile phone is quickly being recognized as the de facto computer of the future for the world's poor, and will enable broad-based learning and knowledge-sharing in the urban wilderness.

Figure 2
Mobile Phones Are Quickly Diffusing Around the World
(Mobile subscribers per 100 capita)



Source: World Bank, *Development Indicators, 2004*.

The mobile phone is not just about communications, but is increasingly seen as the world computer. Together with MIT's Media Lab, the University of Nairobi in Kenya is restructuring its computer science program to focus on mobile phone programming, rather than the traditional emphasis on mainframes and PCs. The Entrepreneurial Programming and Research on Mobiles (EPROM) program seeks to harvest the innovative capacity principal investigator Nathan Eagle describes: "What Kenyans are starting to do with their phones is amazing. Today, in my small town of Kilifi, I can buy milk, pay for a taxi ride, even check the local vegetable prices on my mobile."

Expanding Opportunities for Learning: The \$100 Laptop and Eduwise

Computers are spreading rapidly in extreme urban environments, and in the process being transformed to survive and function where traditional desktops and laptops cannot. These computers are being designed explicitly for the world's poor, especially children—this market trend will create dramatically new opportunities to expand everyday opportunities for learning.

In 2005, MIT Media Lab founder, Nicholas Negroponte, formed a nonprofit corporation that is developing a \$100 laptop for use in developing countries. In July 2006, the One Laptop Per Child organization announced a partnership with the Wikipedia Foundation to pre-load each laptop with selected material from Wikipedia, the collaboratively authored Web encyclopedia.

In addition, a consortium led by Intel announced the development of another low-cost laptop, the Eduwise, which is also targeted at education markets in the developing world. The Eduwise will sell for \$400 and will contain software for students and teachers to share presentations and take quizzes over a wireless connection.

However, as much as these trends highlight the virtues of lightweight infrastructure—wide-spread, low-cost access to learning experiences and basic information—they also illustrate the way in which lightweight systems leverage and connect to more traditional heavy infrastructure. For instance, to achieve the necessary manufacturing economies of scale needed, the proponents of the \$100 laptop have publicly stated that they need five countries to each commit to no fewer than 1 million units. And it is crucial to note that these units are not being marketed directly to students—the state-run educational mega-infrastructures of Thailand, Cambodia and other nations are instrumental players in procuring, distributing, and (hopefully, as this is not clear) supporting and maintaining the devices and broadband connectivity.



Eduwise, low-cost laptop



Leveraging Scarce Internet Access with Low-Tech Media: Pondicherry's M.S. Swaminathan Research Foundation

Despite our infatuation with the high-tech, sometimes traditional solutions like newspapers are the ultimate lightweight solution for cheap, quick, and inexpensive information sharing. The Pondicherry, India-based organization M.S. Swaminathan Research Foundation (MSSRF) uses the local radio stations and newspapers to distribute information that volunteer researchers gather from the Internet. Weather information—for both farmers and fisherman—is a crucial service and provides real opportunities to improve productivity and health and safety. Some 30 volunteers provide these services as well as helping to jump-start over 100 self-help groups across the region.

BOTTOM-UP HEALTH CARE

Delivery of health care services and health information in the developing world is a perennial challenge. The poor state of health care infrastructure, low literacy rates, and the lack of basic infrastructure for power, water, and transportation slow distribution of medicines and supplies. The synergy of lightweight infrastructure—especially mobile network computing—and new models for data collection and sharing are driving innovation in health care delivery and health monitoring.

The Uganda Health Information Network

This is a pioneering effort to use lightweight mobile computing to improve access to medical reference information and develop a more effective platform for collecting and analyzing medical data in the field.

The Uganda Health Information Network's (Uhin) lightweight technology infrastructure consists of (to date) over 200 off-the-shelf consumer PDAs—Palm m130 handheld computers—and 20 access points where health care providers can sync the devices with a central database. These access points are the connection to the central database using the nation's existing GSM cellular network.

BHUMI

BHUMI is a volunteer based socio-political organization in India, currently working to improve living conditions of the poor in the Rasoolpura slum area near Hyderabad. One of the tools it is looking for is an easy way for volunteers to maintain health records of the slum dwellers. Networked PDAs provide a new platform for health care delivery by providing a means for disseminating as well as collecting and receiving information about the health status of individuals—in a sense, victims of disease are empowered to “speak” through these platforms as data on their conditions is collected in an ever-more real-time, accurate, and comprehensive fashion. It is a platform for combating the problem of information poverty in low-income countries.



BHUMI, maintaining health records of the slum dwellers

Mobile Medicine in Kenya

With the fastest growing mobile phone diffusion rate, Africa is an excellent example of mobile phones providing a flexible infrastructure for many basic services including health. Nathan Eagles, a graduate student at MIT, is launching with the University of Nairobi a project-based course called Entrepreneurial Programming and Research on Mobiles (EPROM), a platform for teaching young Africans how to program mobile phones and develop applications that they believe matter to them most. Already in Kenya, mobile phones can be used to buy milk, pay for a taxi, and get the price of vegetables.

The partnership is currently working on a design for a mobile phone application for medical field workers in Kilifi that can interface with the hospital's existing MySQL database of patient records. The issue with the existing system is that the field workers are not used to QWERTY keyboards on mobile devices and would prefer a phone keypad for data input. This creates the perfect opportunity for rapid mobile phone application development in Python—it requires advanced features such as managing sockets over GPRS and creating an intuitive user interface. The promise of such partnerships is that application identification and design originates with African urban residents and programmers.

MICROFINANCE

Lack of financial services is one of the gaps in infrastructure that exacerbates risk in the urban wilderness. The lack of credit, savings, and insurance denies slum dwellers a safety net for major crises such as health or environmental disasters. Microfinance lenders, who specialize in small loans to the very poor, are estimated to have helped 100 million people escape from poverty worldwide.

Distributed Peer-to-Peer Lending: Kiva

Kiva grew out of work conducted in Uganda, Kenya, and Tanzania by the Village Enterprise Fund, and is designed to augment the capacity of existing microlending organizations. Kiva is a peer-to-peer lending platform that matches lenders and borrower using the Web. Beginning in Uganda, Kiva will enable loans to be made in increments as small as \$25 for 6–12 month terms. While Kiva's model closely resembles that of sites such as Prosper.com, it is unique in that it targets very small loans and works closely with local partners in developing countries. In its first year, Kiva funded about a dozen small enterprises and several entrepreneurs have fully repaid their loans. While still small, it is a signal of how future development aid may be administered without traditional intermediaries such as the World Bank, the United Nations, and the U.S. Agency for International Development (USAID).



Professional Financial Alliances: GuildNet

Guild Net is a project concept for an alliance of small businesses and individual entrepreneurs who share professions. As a collective, the group increases their opportunities for loans, credit, and other improvements to their life. The groups function as a small firm and save a portion of their collective earnings for the group in a group account. Individuals also have savings accounts. Members can view the group account but cannot make any transactions within it. Only the bank can make transaction on this account for business purposes, with the agreement of all group members. GuildNet has the potential to leverage cultural factors within distinct communities related to social networks, self-help groups, savings circles, and other cooperative practices.

DYNAMIC TRANSPORTATION

Of all the challenges faced by the megacities of the developing world, perhaps none is as daunting as supporting ever more complex and energy-intensive patterns of personal mobility for millions of new inhabitants. Again, the convergence of lightweight infrastructure and cooperative strategies are offering innovative solutions to this dilemma.

Carpooling by SMS: Koolpool

In Mumbai, India, where an economic and demographic explosion has added an enormous burden to the urban road system, Koolpool has developed a system for organizing shared car rides via mobile phone SMS. The system employs many of the common elements of online cooperative marketplaces—points replace cash to ensure payment and authenticity—and the system even conducts criminal background checks to ensure the safety of participants.

Koolpool illustrates the way in which lightweight cooperative approaches can quickly come into conflict with traditional top-down infrastructure. While the system initially was well-received by government officials as a way to encourage widespread carpooling and reduce congestion, pollution, and transportation costs, it is now in limbo as it conflicts with taxi regulations that prohibit private cars from carrying paying passengers. At the time of writing, the future of Koolpool was unclear.

AD HOC DISASTER RESPONSE

Perhaps the most promising use of lightweight technologies in the developing world has been to enable ad hoc responses to disasters and humanitarian crises. Unlike the industrialized nations, where disaster planning and emergency response have been increasingly the function of professionalized government agencies, developing countries lack capacity to respond effectively to disasters. Even in rich nations such as the United States, disasters that affect a wide area (like Hurricane Katrina) can overwhelm official response capacity.



Koolpool, ride sharing via SMS



Katrinalist.net, post-disaster information Web site

Crisis Communications: SMS Communities and the Blogosphere

In recent disasters, access to lightweight technologies for communication has enabled a broad variety of cooperative response efforts to emerge. At first, these new cooperative uses of lightweight communications built on existing platforms like text messaging (SMS). For instance, before and after the December 2005 tsunami in Southeast Asia, text messages were used extensively to send warnings and share information about damage estimates and the whereabouts of victims. Informal Web tools such as blogs and wikis were widely used to share information about victims and refugees, especially about the large foreign tourist population. By leveraging multiple sources of information, these sites were considered to be more reliable, comprehensive, detailed, and timely than information being provided by national embassies in Thailand.

Emergent Data Standards: Peoplefinder Connects Scattered Katrina Victim Lists

Now, however, emergent responses to disasters are taking the form of entirely new platforms—disasters are becoming a highly effective catalyst for ever more sophisticated cooperative, lightweight tools and practices. Hurricane Katrina spawned a whole new platform for organizing post-disaster social networks. In the immediate aftermath of the disaster, several Web sites were developed to serve as information sources for people searching for loved ones. However, this created a problem, as no single site contained a comprehensive, authoritative list of missing people and there was no data-sharing mechanism. In stepped a self-organized group of volunteers, the PeopleFinder project. In less than four days, the group—which coordinated itself via several Web sites and an IRC chat—had developed and implemented the PeopleFinder Interchange Format data sharing standard. The Salesforce.com Foundation contributed data warehousing services and the Katrinalist.net site began aggregating lists of refugees and victims at that site.



4 | LESSONS FROM THE URBAN WILDERNESS

The main theme of current debate about slums is that they are dangerous and even toxic wastelands that need to be contained, tamed, and remediated, and will never recover without outside intervention. For the most part, the solutions put forward by the United Nations, World Bank, and other major organizations reflect this interventionist approach. However, a growing number of experts is bringing forth a different perspective—that the challenging “urban wilderness” of the third world is incubating a generation of people who can creatively make do with very little. In a sense, slums are becoming sources of innovative practices and do-it-yourself know-how on a scale without precedent in history. Multiple examples of innovation based on the convergence of lightweight infrastructure and cooperative strategies in the squatter communities and slums of the developing world prove that there are vibrant economies being created in what has traditionally been thought of as wastelands. Companies not only need to learn from these innovations but also become active participants in them. But to do so, they need to rethink their traditional strategies and market approaches.

DESIGN PRODUCTS FOR REUSE AND REMIXING

First, companies need to learn how to make products that are adaptable for re-use in do-it-yourself applications. For the slum poor, every purchase has to meet a multiplicity of needs and degrade usefully over its lifecycle. Second, companies need to deepen their understanding of how the urban poor modify products and remix services to accomplish their goals. IFTF’s ongoing Global Ethnographic Network research is providing valuable insight into these practices, but companies must continue to expand their own capacity to understand the changing assumptions of these future consumers. (See *Zones of Instability: A Context for Technology Adoption* [SR-1032].)

FOCUS ON NETWORKS AND ECOLOGIES, NOT INDIVIDUAL CONSUMERS

The intersection of lightweight infrastructure and cooperative dynamics taps into the power of social network and ecologies of groups, roles, and resources in local communities. Business strategies ranging from marketing efforts, to hiring and sourcing strategies, and technology diffusion approaches should focus on local networks and ecologies rather than on individual consumers. This is not to say that individuals should be left out of the equation. On the contrary, it means that individuals need to be considered as part of various webs of interaction through which different kinds of value, knowledge, and capabilities flow. (See Verna Allee’s work on Value Webs to learn more about the flow of tangible and intangible benefits through value webs).

By focusing on individuals outside of their connections, marketers, for example, will miss out on the bigger social picture of how products create value or unintended consequences



Urban wilderness in Mumbai, India

for consumers. HR directors will not see how individuals learn from the networks or share resources and know-how from ecologies. In the National Academy of Engineering blog, George Bagliarello points out that megacities in the developing world have a different labor-machine equation and that technologies should account for this.

For example, waste-sorting technologies may be technically and aesthetically appealing but would disrupt local social networks of residents who sort waste as a living and fill a niche in an urban wilderness ecology. In this case, successful technologies would catalyze these types of local social networks and the roles they fill to increase their impact on urban communities and expand the value they provide. This is evident in the Ashoka funded effort, Waste Concern, in Dhaka, Bangladesh that provides a sustainable and economically successful waste-collection venture. Former waste pickers have been incorporated into the scheme with better paying and more hygienic jobs. In addition, a thriving organic compost market has emerged providing a cheaper and much needed alternative to chemical fertilizers that deplete the soil.

SUPPORT LOCAL LEAD USERS

The World Bank's Robert Buckley has argued that there are high-return investments in slums that could be made, but funds are not flowing to them because Western institutions have not recognized these opportunities. Developing local innovation hubs that attract so called "lead users" of the urban wilderness will help capture new ideas and strategies to solve local problems in the world's extreme cities. Companies should look for the "positive deviants" living in slums, squatter communities, and the poorest communities. These are the people who are breaking the rules, bending the laws, and identifying the seeds of new solutions that could be further developed with the right partnerships and support. Investing in local centers that provide tools to lead users and positive deviants—such as Internet access, training in coding/application development (such as the EPROM example), and even fabrication tools for prototyping (such as MIT's FabLab) will help direct the energies of creative thinkers in the urban wilderness.

BUILD NETWORKS TO CONNECT ACROSS ISOLATED URBAN COMMUNITIES

The isolation of poor communities has often benefited big business—price differentials can be maintained, advertising messages can be precisely targeted, and competitors monitored and contained. However, experiments such as Kiva's peer-to-peer lending and Koolpool's SMS-based carpooling suggest that the new opportunities in developing countries lie in connecting isolated communities and individuals together. While economic globalization has leveled the playing field between countries, it has done little to break down barriers at the local level, where the real future gains in innovative capacity lie. Becoming a trusted connector positions firms well to tap into new innovations and practices that emerge from these urban wilderness areas.



Waste Concern, sustainable and economically successful waste-collection venture



BLEND LIGHTWEIGHT TOOLS WITH COOPERATIVE STRATEGIES

All too often, we are tempted to see technology in black and white impacts—for example, Amazon.com caused many local bookstores to go out of business. While this statement is true, Amazon also has created a global marketplace for hundreds of millions of mom-and-pop booksellers, and liberated many rare and out-of-print books from private libraries and the dusty shelves of storerooms. The small bookstores that have survived now thrive by using Amazon to develop a global specialty in rare books.

The lesson for companies is that they should consider every exercise in cooperative strategy to be a parallel, simultaneous exercise in lightweight technology and networks. While often large firms may not be able to do either well, they can and should consider ways to provide an interface between the macro-economy and the micro-economy, as they can profit from being a hub of a new lightweight, grassroots network.

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.

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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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