



Catalyzing the New Mobility in Cities

A Primer on Innovative Business and Service Models

B. de la Peña and R. Albright

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Introduction

The Rockefeller Foundation marks its 100th year in 2013. The Foundation’s mission, unchanged since 1913, is *to promote the well-being of mankind throughout the world*. Throughout its 100-year history, the Foundation has supported the ingenuity of innovative thinkers and actors by providing the resources, networks, convening power, and technologies to move innovation from idea to impact. It supports work that expands opportunity and strengthens resilience to social, economic, health, and environmental challenges.

The Rockefeller Foundation seeks to achieve its mission through work aimed at meeting four equally important goals: *Revalue Ecosystems, Advance Health, Secure Livelihoods, and Transform Cities*.

In 2011, the Rockefeller Foundation started an exploration (or a “Search”) of emerging innovations in the transportation sectors of cities in the developing world. Entitled “Catalyzing the New Mobility in Cities,” the exploratory effort focused on identifying innovative business and service models that were beneficial to the urban poor, both as users and providers of urban transportation. The Search investigated the following questions:

1. What new business or service models are emerging in the public transportation sector in cities in the developing world that benefit (or can benefit) the poor and vulnerable?
2. What are the market barriers to and enablers of implementing these business models?
3. What are the policy barriers to and enablers of implementing these business models?
4. How can these models be scaled within cities and replicated across cities?
5. How are cities integrating new and existing modes of transit that are beneficial to the urban poor?

Over the course of 2012, the Foundation worked with its partners and grantees to answer those questions. The Foundation funded work in the Ateneo School of Government in the Philippines; Chulalongkorn University in Thailand; EMBARQ and Intellectap in India; the University of Nairobi’s School of Computing and Informatics in Kenya; Columbia University’s Center for Sustainable Urban Development in New York; and the University of Michigan’s SMART Initiative.

This primer offers a partial summary of the findings related to the first question, focusing on the emerging innovative business and service models.

New Mobility and the Urban Poor

The growth of cities in the global south is driving demand for better urban transportation. In India alone, total passenger trips in 87 major urban centers is expected to more than double between 2007 and 2031, rising from around 229 million to 482 million per day. Responding to the demand and growing traffic congestion, many fast-growing cities in India and elsewhere are investing heavily in transportation infrastructure. Unfortunately, the needs of low-income households are often overlooked in the selection, design, and service decisions related to these investments.

and shared transport services by reducing road space and often segregating them into slower moving lanes or side roads to free up space for private vehicles. As a result, public transit users spend more time in their daily commute than those who can afford private transport.

Many cities also lack adequate infrastructure for pedestrians. What passes for investments in pedestrian infrastructure often includes overhead bridges that facilitate vehicular traffic but burden the pedestrian with indirect and longer routes. The urban poor depend heavily on walking, biking, and especially public transportation for employment, mobility, and access to services; they are thus more vulnerable to inefficiencies and shortcomings in transportation systems. According to the World Bank, urban public transportation systems disproportionately disadvantage the urban poor and vulnerable, especially in the developing world.

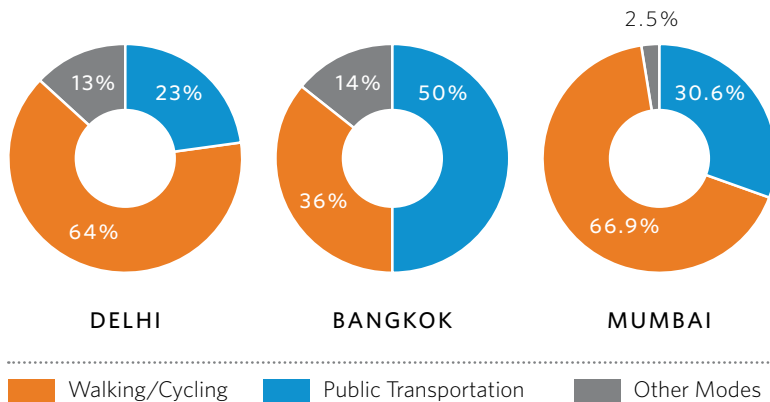
Meanwhile, new mass transit systems, built at high costs and with sovereign guarantees and direct subsidies, must charge higher than the poor are able to pay. For example, median per capita monthly income in Delhi is US\$104, yet 77% of the commuters who use the metro make more than US\$378 per month (2010-2011 figures).¹ New mass transit infrastructure also often results in the removal or severing of existing public transportation networks that disproportionately employ the urban poor as drivers or providers.

A sizable proportion of the urban poor earn their livelihoods in the informal or para-transit sector. Intellecip's survey of urban transportation in ten cities in Africa, South Asia, and Southeast Asia showed that between 7 and 20% of households in the urban population—the majority of them poor—worked in that sector.

Informal transit provides low barriers to making a living, requiring little by way of skills. Most migrants start out as rickshaw pullers or *ojek* drivers. While entering the sector is easy, the defining features of informal transport workers include the following:

Modal Shares of Low Income Commuters in Three Sample Cities

(Intellecip, 2012)



Cities are building or expanding urban transportation infrastructure, that are often already exclusionary and biased in favor of private-use vehicles and against pedestrians and shared transport. On a per capita basis, public transport receives a smaller share of the investment pie than roads and highways. Traffic engineering, which is committed to moving vehicular traffic, treats shared transportation services (buses, jitneys, etc.) as nuisances to smoother traffic flow. For example, buses must stop at various intervals to drop off and pick up passengers, a reality often viewed as a traffic management problem. Policy decisions solely based on traffic engineering considerations usually penalize public

¹ Dwivedi, S.P. (2011). *Impact of Metro on Mobility Patterns of Metropolitan City, Case Study: Delhi* (Post graduate thesis). School of Planning and Architecture, New Delhi, India

- Many are among the poorest of the poor.
- Their working and living conditions fall at the survivalist end of the spectrum.
- They are excluded in law and/or practice from labor and social protection.
- They lack representation and voice and are unorganized or ineffectively organized.
- They endure job insecurity, low and fragile incomes, harassment and corruption, poor (and often dangerous) working conditions, and no access to training.²

Informal transit does create the potential for some economic mobility, usually when drivers become owners of their vehicles. However, the process can be economically onerous. In countries and cities without active financing programs that target the paratransit sector, would-be owners are prey to loan sharks and suffer exorbitant black market lending rates. Some nominal owners effectively become indentured servants to criminal lenders. Moreover, owner-drivers do not escape the dangerous working conditions on the road or harassment from corrupt authorities.

The costs of exclusionary public transportation systems to the poor extend beyond lost time and high fares; the system also affects poor people's ability to access livelihoods and services. Moreover, transportation infrastructure and policies directly influence the health and safety of vulnerable populations. Nearly 1.3 million people die and 20 to 50 million people sustain injuries in urban road accidents each year; 70% of these deaths occur in developing countries and generate a direct economic cost of 1% to 2% of worldwide GDP. A majority of such victims are poor pedestrians and bicyclists, mostly between 15 and 29 years old. Such accidents can be economically catastrophic for families who lose a breadwinner or have to tend to and cover the medical costs of an injured family member.

Changing Paradigms

Cities are re-thinking their approaches to transportation and planning to make substantial investments

in new and upgraded infrastructure. A recent McKinsey report calculates that Asia countries alone will commit \$2.5 trillion to transport infrastructure projects over the next decade to remedy historical under-investment and accommodate the explosion in demand for safe, sustainable transportation. A global coalition of advocates for Sustainable Transportation (led by groups such as SloCAT, EMBARQ, ITDP, and the Partnership for Clean Air) have succeeded in developing and scaling transport solutions that prioritize moving people over moving vehicles. They are also successfully capturing mindshare, anchoring the need for sustainable transportation to global development and climate change mitigation agendas.

At the Rio +20 in June 2012, the eight largest multilateral development banks (including the World Bank and the Asian Development Bank) committed \$175 billion over the next decade to support sustainable transportation. The United Nations has also increasingly emphasized mobility by making sustainable transport a critical part of the Secretary General's Action Agenda for Sustainable Development Goals (the successor to the MDGs.)

While sustainable transportation gains increased traction, much less attention falls on issues of inclusion in the sector. The dominant analytical frames largely privilege environmental sustainability and the reduction of greenhouse gasses. The popular Avoid-Shift-Improve (ASI) paradigm for evaluating transportation plans does benefit the urban poor by prioritizing pedestrian and bike facilities. Yet, ASI focuses on modal shifts away from private car use and puts no premium on the livelihoods of informal transit workers.³

Emerging Opportunities

As advocates of sustainable transportation work to change urban transportation policy, innovative business and service models are also working to improve urban transportation by making it more efficient, dependable, and sustainable. These models, collectively referred to as the emerging *New Mobility* sector, disrupt the established transportation

² WIEGO's report on Informal Transportation Workers. Available online via www.wiego.org.

³ A document released by SloCAT in January 2013 entitled "*Alleviating Poverty through Sustainable Transport and its relevance for the post 2015 Global Development Agenda*" made no mention of workers in the sector or their condition.

systems in more developed cities by taking advantage of information technology, the ubiquity of mobile phones, cellular networks, and GPS and internet infrastructure. Services such as bike share, ZipCar®, Waize®, Hopstop®, and Uber® reduce consumption and reconfigure the relationship between modes, users, and providers of transportation.

As Susan Zielinski of the University of Michigan's SMART Initiative puts it: *"Transportation is at a crossroads. In response to rapid urbanization, shifting demographics, and other pressing social, economic, and environmental factors, cities and regions are shifting investment dollars from single mode infrastructure to multi-mode, multi-service, IT-enabled door-to-door systems, and car companies are*

rebranding themselves as transportation companies. Enter New Mobility, where innovations and opportunities go beyond the sectoral bounds of the traditional transportation industry. This industry is being accelerated by the emergence of new fuel and vehicle technologies, new information technologies, flexible and differentiated transportation modes, services, and products, innovative land use and urban design, and new business models." (Zielinski, 2006)

This innovative industry sector provides a key opportunity to leverage massive investments in transportation infrastructure to benefit the poor and vulnerable and to build more inclusive cities and more resilient communities.

Prerequisite Elements for Inclusive Mobility

Innovations in transportation and mobility hold promise, but their effectiveness in building inclusive cities is limited unless certain prerequisite elements are met. Cities that want more inclusive transportation must pursue policies that prioritize pedestrians and non-motorized transit, acknowledge the role of informal transit, integrate transportation and land use, commit to transparency and open information, and practice participatory planning (predicated on an engaged civil society). Cities also need well-informed decision makers and must provide financial resources.

walk or bike and thus benefit greatly from these facilities.

Acknowledging the Role of Informal Transit:

Informal transit modes have become ubiquitous in cities in the developing world, mostly in response to the lack of public transit (or the withdrawal or lack of public investment in transit). Following those models, small buses, jitneys, pedal-powered and motorized three-wheelers, and motorcycles used for public transit around the world have emerged to fill very similar niches in various metropolitan regions.

These privately provided transport services are often loosely or inefficiently regulated. Most city transportation agencies tolerate informal transit as provisional, necessary nuisances and rarely provide any affordances in infrastructure or policy. Plans for mass transit rarely propose the integration of informal transit services and often assume they will be eliminated. Providers are ill-trained (if trained at all) and often subject to extortion and corruption.

Despite the seeming chaos, the highly distributed nature of informal transit can easily fulfill the five core characteristics of resilient systems:

- **Flexibility** – The ability to adopt alternative strategies, especially when changing circumstances preclude returning to previous modes of operation.

"The most critical needs are good public transport services and easy access to them through good sidewalks, etc."

– O. P. AGARWAL, THE WORLD BANK

Prioritizing Pedestrians and Non-motorized

Transport: The most immediate and visible manifestation of prioritizing people over cars is a city's investment in sidewalks and pedestrian paths. Dedicating road space for bikes, in well-marked or separated lanes, creates safer conditions for bikers and consequently encourages more people to shift. As noted above, the urban poor are more likely to

- **Redundancy** – Spare capacity to accommodate increasing demand or extreme pressure. Redundancy also concerns diversity and the ability to adopt alternative pathways and a variety of options.
- **Resourcefulness** – The capacity to identify and act on problems, to establish priorities, and to mobilize resources and assets to achieve goals.
- **Safe Failure** – The capacity of resilient network infrastructures to absorb shocks and cumulative effects of slow-onset challenges so as to avoid catastrophic failure if thresholds are exceeded. Resilient systems have built-in mechanisms that prevent failures from rippling across the whole network.
- **Responsiveness** – The ability to re-organize and re-establish function and a sense of order following a failure.
- **Learning** – The ability to use direct experience to self-organize, even if that experience includes elements of failure.

Integrating Transportation and Land Use:

Urban transportation infrastructure affects not only mobility but also the value and utility of adjacent land. Land that becomes more accessible becomes more valuable. Cities can capture the value created by the infrastructure either directly (with instruments such as tax increment financing) or indirectly by increasing allowed densities and mixing land uses. This is particularly true of mass transit infrastructure. The increased density brings more potential users to the mass transit (potentially increasing ridership and fare box receipts).

The separation of functional uses or use-zoning in planning increases the demand for mobility and transportation. Cities that integrate and mix land uses, allowing institutional, commercial, residential, and even small-scale manufacturing uses to co-exist within walking distance are able to reduce the number of non-walking trips within their city, therefore reducing the demand for longer range mobility.

Open Information: The utility of transportation systems correlates directly with the availability of information that helps the user to decide which route or mode to take. In most cities in the developing world, this knowledge is rarely codified but

exists as common knowledge among local residents who are familiar with the workings of the transportation system. The availability of open platforms (such as Open Street Maps) creates the possibility of capturing this local knowledge, making it more legible and providing automated or assisted guidance.

“ Information technology is a huge innovation. It gives the urban poor access to better information about services and options with real-time information. Also, IT will be important to give them options to not have to move.”

– JUDITH POLLOCK, SHELL FOUNDATION

The emerging technologies that are reinventing transportation in the developed world are anchored to the availability of reliable information such as accurate digital maps, digitized route data (time and frequency of transit), and user data. Transportation data that adheres to open standards and open-data formats creates a platform for building applications (such as algorithms that choose the optimal routes) and services and for delivering just-in-time information to users and transit providers.

Readily available data and analysis also facilitate better policy formulation. Transparent decision-making, based on reliable information and sound analysis, also improves the acceptance of policies and ensures better selection of investments.

Participatory Planning: Cities that enact participatory mechanisms increase the likelihood that transportation investments will benefit larger segments of the population. Such planning ensures that infrastructure and service design will be optimized to the needs of communities, not just of car owners. It also reduces the risks of unintended consequences that could exacerbate exclusion.

Civil Society: Participatory transportation planning will not succeed unless NGOs and other citizen groups engage the planning and decision-making process and can advocate for issues of inclusion and sustainability.

Well-informed decision makers: Elected and appointed public officials, at all levels of government and at all stages of the policy and decision-making process, must be aware of the costs and consequences of exclusionary urban transportation systems. In many cities, the existence of “champions” for sustainable and inclusive transportation in the public sector (with support from citizens and civil society) leads to significant shifts in public policy.

Cities that are considered models of inclusive mobility, such as Bogotá, Colombia and Curitiba, Brazil, have one important element in common: local government officials who support programs to advance the mobility of the urban poor. These advances are frequently driven by forward-looking mayors who appoint administrators who prioritize the improvement of transportation alternatives for the poor.

Financial Resources: Cities must be willing to invest in transportation infrastructure, not just to address current problems but also to provision for future

urban growth. Transportation investments geared purely to relieving traffic congestion will fail to build sustainable and more inclusive communities. The commitment should not only show in large-scale items (such as new rail or bus rapid transit systems), but also in the expansion and upkeep of pedestrian and bicycle networks. National and local governments should be willing to encourage entrepreneurship in the informal transportation sector by providing accessible financing. They should also consider targeted subsidies for low-income mass transit users to democratize the benefits of public investments and to make sure that the mass transit facilitates economic mobility.

The ingredients above are necessary for inclusive mobility to become policy and to provide fertile ground for innovations that improve access, affordability, and reliability of mobility options that cater to the poor.

Example: NUTP and Rasta Recycle

In 2006, the government of India approved the country’s first National Urban Transport Policy (NUTP). The policy is part of the massive Jawaharlal Nehru National Urban Renewal Mission (JNNURM), a seven-year, US\$20 billion city-modernization scheme launched by the Government of India under the Ministry of Urban Development (MoUD). NUTP was designed to encourage integrated land use and transport planning in cities by providing central funds for state and city governments. It focused on increasing the availability and use of public transport and non-motorized modes in Indian cities. The NUTP came about largely through the facilitation of groups like EMBARQ India and other advocates for sustainable urban transport.

As part of the NUTP, the MoUD works with cities to launch and sustain public bicycling (bike share) systems across India. In some cities in India, bike trips account for as much as 20% of all trips. To support bike share systems, cities would need to create safe bicycle infrastructure that would benefit all bikers, including the poor. MoUD initiated the Public Bicycle Scheme project in June 2011 and plans to support five pilot sites in 2013 and seven additional sites in 2014.

Aware of the lack of capacity and knowledge among city agencies, EMBARQ launched a program called “Rasta Recycle” (Hindi for “recycle the road”) to assist MoUD and the pilot cities. EMBARQ created guidance documents on financing and model concession agreements and are actively helping select cities to roll out the pilots.

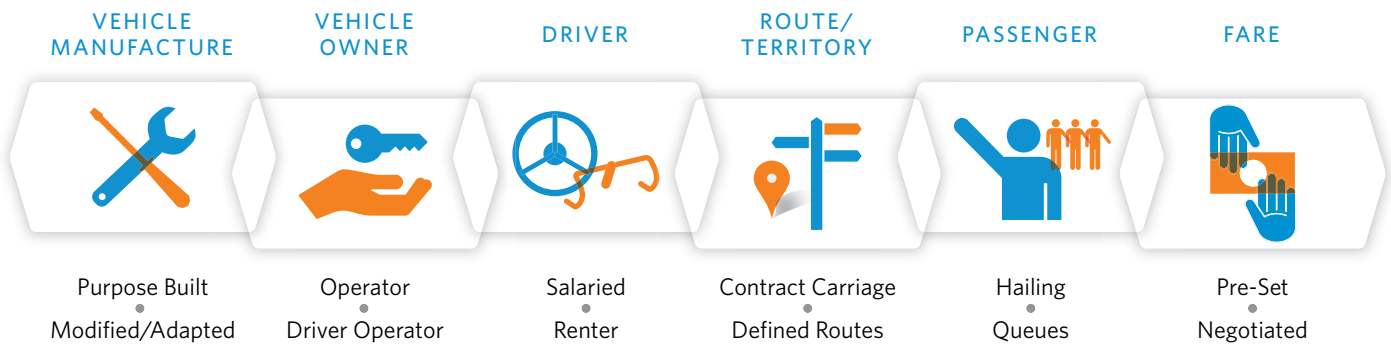


Innovation

The Foundation sees innovation as a break from previous practice. This occurs when different points of view or existing elements are framed, imagined, or combined in new ways. In the context of the Foundation’s work, innovations succeed when they challenge assumptions and change the status quo, resulting in positive and lasting change in the systems that affect poor and vulnerable populations.

The Foundation’s exploration in this space uncovered a rapid growth of innovations in the transportation sector in cities in the developing world. The research did not explicitly seek to identify the cause or causes for these innovations; rather, it considered how these innovations could possibly affect the poor and vulnerable in a positive way. This report lists some hallmark examples of emerging innovations in business and service models.

The Informal Transportation Value Chain



The value chain in informal transportation is relatively simple with similar arrangements and variations: Purpose built or modified vehicles are bought by owners who then rent them to drivers to run routes or territories (which can be purchased as a franchise or through registration). Passengers board the vehicles either through designated queues or by hailing them on the street. If the vehicle is a “contract carriage,” the passenger and the driver will negotiate the fare based on some accepted base rate plus an additional charge per unit of distance. In shared carriages, the fare is a uniform rate with graduated increases per unit of distance.

All income is derived from the fare and the proceeds go to the driver (sometimes through a conductor/fare collector) to pay the rent for the vehicle (which goes to the operator). Whatever is left over after paying the rent constitutes the driver’s and the conductor’s income for the day.

Slight variations may exist, depending on the type of vehicle, how many passengers it can carry, and the level of regulation the government applies to the particular service. The diagram on the next page shows the gradations of regulatory control and enforcement across public transportation modes.

The innovations we outline in this primer are representative of the new approaches that entrepreneurs are applying to the value chain. They are flourishing organically as local entrepreneurs recognize the business opportunities of improving paratransit services to meet the large and growing demand for mobility. Some promising models are new and just emerging to meet the needs of the drivers living in relative poverty or of poor urban passengers. Others are adaptations of approaches that are emerging in the United States and Europe; others are innovations that have been evolving and improving slowly for years, but have been recently accelerated by IT and

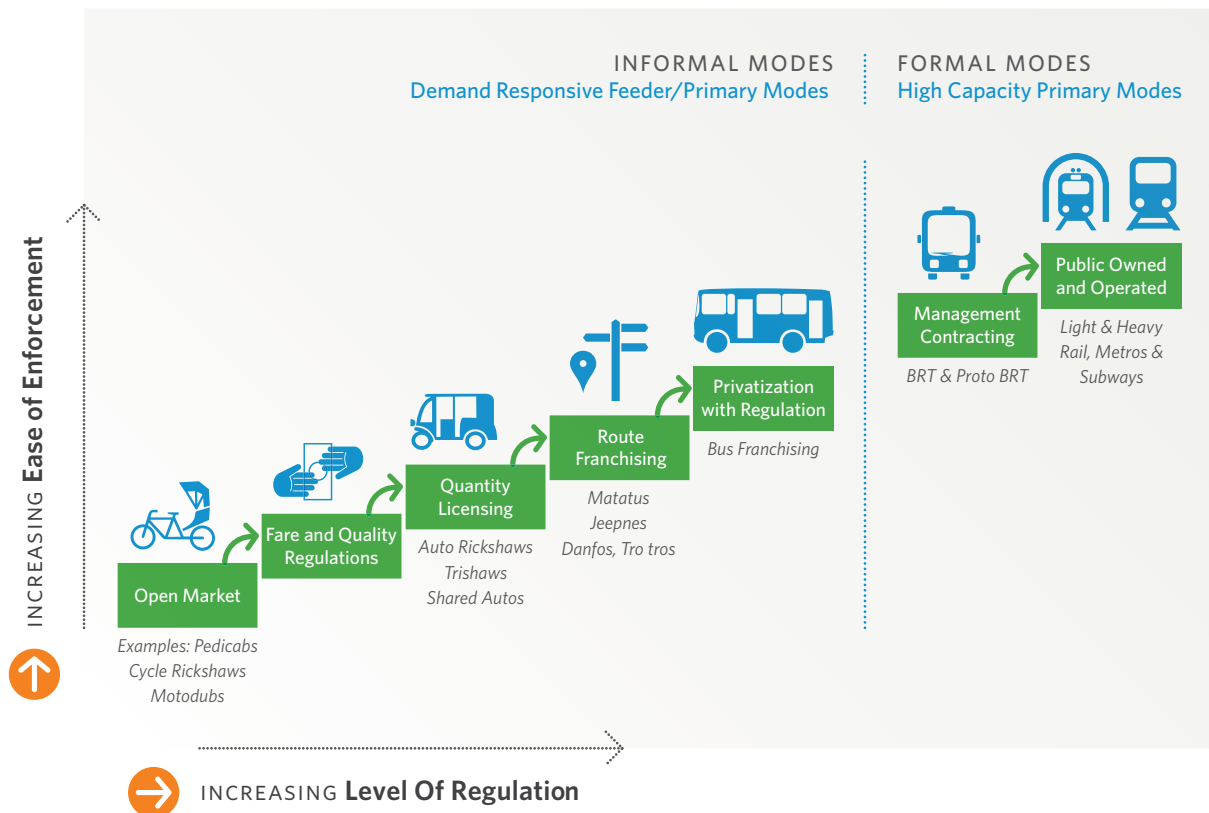
cell phones. Most are started by social entrepreneurs whose primary mission is to improve the incomes and working conditions of the urban poor. These models affect the triple-bottom line of economy, environment, and equity and are accruing better value for operators, drivers, and passengers.

Some of the benefits these innovations bring to the system are:

- More efficient routing
- More reliable and predictable service
- Transparent (and often reduced) fare rates
- Economies of scale
- Better income distribution
- Opportunities for ownership
- Bypassing corruption
- Improved safety
- Better work conditions
- Improved work benefits

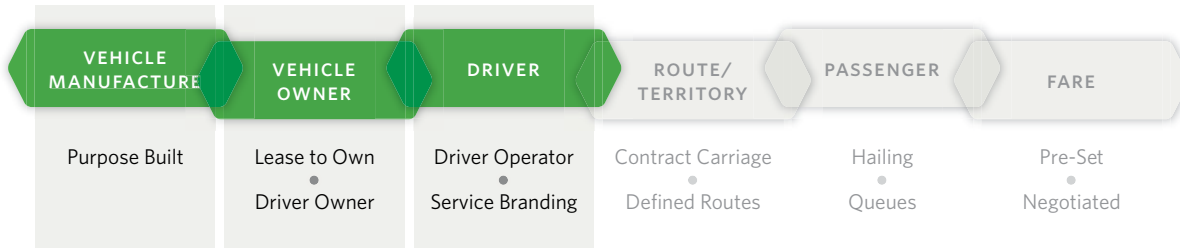
Formality and Informality vs. Regulation and Enforcement in Public Transportation

(Intellect 2012)



Examples of Innovative Business and Service Models

Rickshaw Bank of Guwahati (Guwahati, Assam, India)



The Rickshaw Bank’s (RB) innovations are in vehicle technology and vehicle ownership. RB marries a lighter, purpose-built bike with a lease-to-own system that makes it easier for drivers (also known as “pullers”) to own and operate their own cycle rickshaws. With help from the Indian Institute of Technology, RB developed the “Deep Bahan,” a lighter cycle rickshaw that provides better weather protection for the puller and passengers. The rickshaws weigh about 18 kg less than the 100 kg conventional rickshaws. The panels on the back of each vehicle also augment the driver’s income by providing space for advertising.

RB’s rental-ownership model leases rickshaws at a daily rate of Rs. 25 and then transfers the ownership to the puller after 18 months. Taking a cue from the Grameen Bank, RB requires the pullers to join a rickshaw garage. Each garage has five groups, and each group has five drivers who take a loan for the rickshaw. The garage manages their savings, repairs the rickshaws, and collects the rent daily. The garage also provides the pullers with a uniform, shoes, licenses, a photo identity card, and related training—all as part of Deep Bahan’s branding to set it apart from other services and to signal trust and reliability.

Part of the loan payments go to providing insurance that covers the rickshaw for Rs. 9,000 against damage or theft, provides third party insurance of Rs. 10,000 for the passengers, and covers the driver for Rs. 50,000 against injury or death.

There are some 8 million rickshaw pullers (drivers) in India, yet less than 10% own their rickshaws. The rest rent their vehicles from a private owner, paying as much as Rs. 40 per day (\$0.75) to use the

rickshaw. The puller typically takes home less than half of what he pays in rent. (In 2005, the World Bank defined extreme poverty as living on less than US\$1.25 a day.)

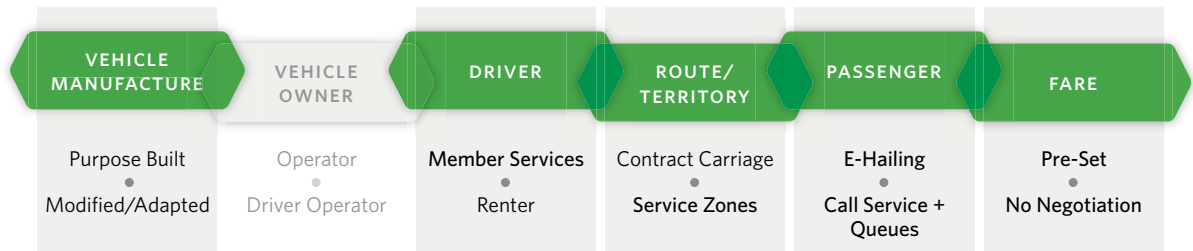
The Rickshaw Bank (RB) was founded by Pradip Kumar Sarmah, a veterinarian in the city of Assam, and is now the flagship project of the Centre for Rural Development. By 2010, RB had helped more than 4,500 pullers own their rickshaws, it is rapidly expanding its reach to other areas in India.



Pradip Kumar Sarmah, the founder of Rickshaw Bank, driving one of RB’s light rickshaws.

(Image by fo assam from Guwahati Run and Walk.)

Fazilka EcoCabs (Fazilka, Punjab, India)



Fazilka EcoCabs' primary innovations fall on both the passenger side and the driver side of the value chain. The innovations not only improve the service, but they also bring order to the otherwise chaotic system of cycle rickshaw service.

EcoCabs also created a unique interface between the rickshaw queues and the call service. It enlists the *chai wallah* (the person selling tea on the sidewalk next to the queue) as dispatcher. The *chai wallah* receives the call or message from the service center, dispatches the next rickshaw in the queue, and relays the relevant information back to the call center.

A chai wallah fields a call at an EcoCabs cycle rickshaw queue

(Image courtesy of Fazilka EcoCabs)



On the driver's side, EcoCabs runs a membership model with incentives. Pullers who sign up for the service receive benefits such as free or subsidized health insurance, free medical consultation and lab testing, discounted medicine pricing, legal aid, access to computer literacy training, and an indoor waiting area with entertainment in between service calls. Beyond the driver-specific benefits, EcoCabs also provides benefits to the families of drivers, such as school supplies for their children and education scholarships for girls. EcoCabs has also developed lighter models of cycle rickshaws with designs that allow the back seats to fold down to give the pullers a place to stretch out and rest. Approximately three-fourths of EcoCabs drivers own a rickshaw, a higher rate of ownership compared to other rickshaw operations.

EcoCabs provides customers with a convenient call-or-text-for-a-cycle rickshaw service layer that fields requests to the nearest rickshaw queue. Would-be passengers are spared the extra walk to the nearest

queue or from having to wait at the sidewalk for a passing, empty cycle rickshaw. The call services provide the passenger with the estimated time of arrival and the correct fare, increasing service reliability and predictability. The call center also provides the name of the puller, adding a measure of safety and trust.

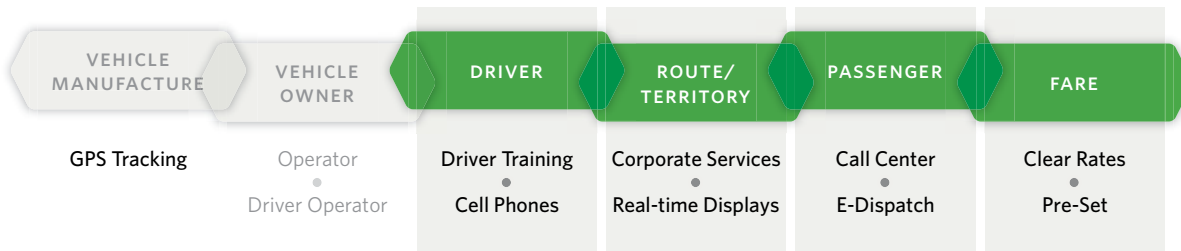
EcoCabs' system has not only improved response times for passengers, but it has also increased profitability for drivers by 20% to 25% per day.

EcoCabs continues to expand and innovate. Starting in 2008 with 100 cycle rickshaws and 5 call centers, the service now has a network of 9 call centers in Fazilka and 300 rickshaw providers in Fazilka as members (out of a total of 450). EcoCabs has rolled out a smartphone app to facilitate bookings and is expanding to at least 22 other cities across India.



Mobile interface of EcoCabs' Android App

Nirmal Foundation's G-Auto (Ahmedabad, Gujarat, India)



The innovations from Nirmal Foundation's G-Auto program are mainly on the passenger service side of the value chain; they focus on service delivery improvements to make auto-rickshaws more professional, reliable, and trustworthy. Like EcoCabs, G-Auto provides a 24-hour reservation and dispatch call-center service for its customers. The call center acts as the "middle-ware" in the system, facilitating the transaction between passengers and auto-rickshaw drivers, including a dedicated complaints and suggestions line. The call service makes the fare transparent (ordinarily, passengers must haggle with drivers) and increases safety for passengers by eliminating the need to wait on the curb. (This is especially critical during off hours.)

The G-Auto member rickshaw provides perks to passengers, such as free newspapers and magazines, free cellphone charging, and a city map. Drivers must also keep their rickshaws clean and spotless.

G-Auto works through a driver membership program. Members receive benefits that include health insurance (cash free treatment up to Rs. 50,000); life insurance up to Rs. 200,000; a pension plan; access to banking services; a credit facility; and educational allowances for their children. G-Auto also provides training, especially in etiquette and how to courteously engage passengers. (G-Auto has also secured a partnership with the Gujarat state tourism department to train and promote auto-rickshaw drivers as tourist guides.)

Apart from the benefits, the service has also improved the livelihoods of the drivers by reducing idling time and allowing them more predictable incomes. The drivers may also augment their income by selling publications and refreshments to

the passengers as well as ad space on the vehicle. (G-Auto facilitates the contracting.)

At the fleet level, G-Auto negotiates corporate service contracts with private companies, providing auto-rickshaw service on demand. G-Auto is also the first dial-a-rickshaw service allowed to operate in the airport.



G-Auto now claims some 10,000 driver-members in Ahmedabad, Gandhinagar, and Vadodara. The company has seen sustained growth over the past three years and plans to scale up and integrate with formal transit systems, such as buses and railways, by installing the auto-rickshaws with GPS-enabled services and providing real-time information on the nearest bus stops and approaching buses.

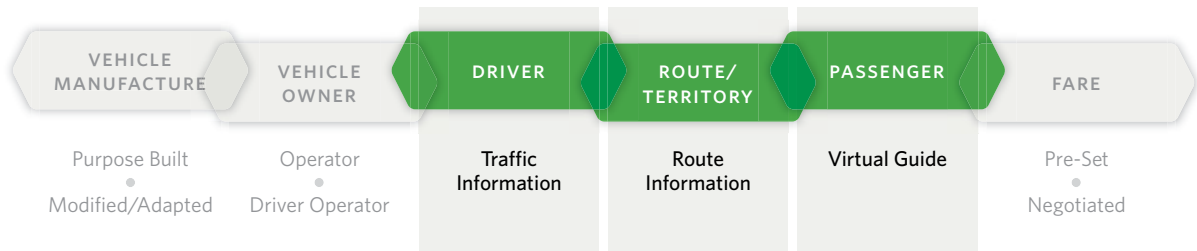
More information: www.g-auto.org

Other auto-rickshaw call center services have also emerged in India, including AyAuto in Pune, Rickshawale.com in Mumbai, and EasyAuto in Bangalore.

Interior of a G-Auto member auto-rickshaw showing the free reading materials

(Image courtesy of G-Auto.)

MatNavi (Nairobi, Kenya)



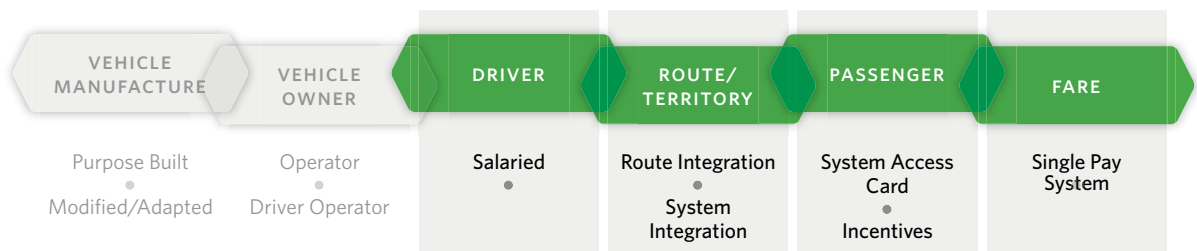
The innovations of MatNavi (*Matatu* Navigation System) focus on using cell phone and GPS data to bring better information to *matatu* drivers and passengers. *Matatus*⁴ are privately-owned minibus shared-taxis that ply intra- and inter-city routes in Kenya. Until recently, *matatus* and city buses were the only form of public transportation in Nairobi. The city belatedly enacted regulations that are intermittently enforced. There are prescribed routes, but the system is often confusing, except to regular riders. The route numbers, covering both buses and *matatus*, start from #1 (a bus that goes from GPO to Ngong Road, Dagoretti Corner) to #237 (a *matatu* from Kencom to Thika). The numbering system skips frequently—237 is preceded by 145 and 137. MatNavi attempts to bring legibility to the system by serving as a virtual guide and providing route information to drivers and commuters.

MatNavi takes cell phone data (volunteered through SMS or smartphone apps) and uses traffic flow modeling and simulation to inform *matatu* passengers of nearby routes and their destinations. It also informs drivers of traffic congestion, warning them to take alternate routes. Using a smartphone app, MatNavi users can view an entire route's information in a menu and can choose a particular route to view the approximate time and cost of each peak and off-peak hour of the day. The application locates a vehicle, checks its speed and traffic flow, and informs the commuter of the wait time.

More information: www.matnavi.co.ke

MatNavi is not the only player in the emerging transportation information market in Nairobi. Matatu Online provides a similar service, while Jambonairobi provides stylized system maps.

Hangzhou Omnipay Card (Hangzhou, China)



Hangzhou Omnipay Card's primary innovation is the creation of an integrated payment system where the passenger needs only one card to access multiple transit options in the city. Omnipay card holders can use the rechargeable value card to pay for the city's

metro, bus, bike share, and car share services. The card makes navigating the city's public transport system (including the fractional use services) seamless to the commuter.

⁴ The term "matatu" is a Swahili colloquialism. One explanation for the origin of the word is that *matatu* minibuses used to cost three pennies to ride. The bus conductor would call out "*mapenny matuatu*," meaning "three pennies" in Kiswahili. This was shortened to "*matatu*" and name remained, despite eventual increases in fares. The form of the vehicle and the shared taxi service has become ubiquitous in large African cities. The system is also known as *matatu* in Kinshasha, but is called *dala dala* in Dar Es Salaam; *tro tro* in Accra and Freetown; *danfo* in Lagos; and simply *minibuses* in Cape Town, Johannesburg, Addis Ababa, and Cairo.

Omnipay also provides incentives for users, including a free first hour rental for the bike share. Users also receive an additional 30 minutes of free bicycle rental time when they use the card to connect to or from the bus or metro, as well as credits on the car share service. These incentives prove particularly beneficial to low income households.

Omnipay is expanding its system to other cities in China.

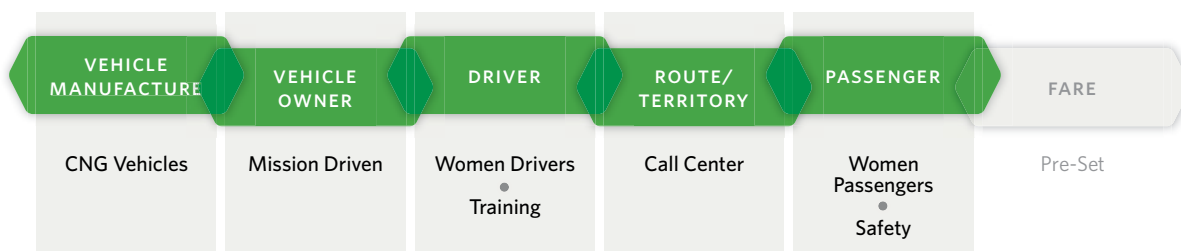
More information: www.omnipay.cn/english.html

One of Hangzhou's public bicycle rental system stations

(Image by bricoleurbanism)



Viira Cabs (Mumbai, India)



Viira Cabs' primary innovation is to provide a taxicab service where women drivers serve only women customers. The unique service promises safety for women passengers 24 hours a day. Viira also provides a new livelihood opportunity for women in a field historically only open to men.

For passengers, Viira guarantees an affordable, reliable service that uses clean, well-kept, and air-conditioned vehicles. (Viira uses a fleet of 5 to 7 seat

Maruti EEECO mini-vans that run on compressed natural gas [CNG].)

On the employment side, Viira provides opportunities for low-income women to become drivers and earn a living wage. Women who have no previous skills can complete Viira's 3-month training program to become proficient taxi drivers. The training includes 155 hours of driving practice in addition to classes on traffic signs, simple auto repair skills,



Viira Cab's women drivers and its fleet of CNG mini-vans

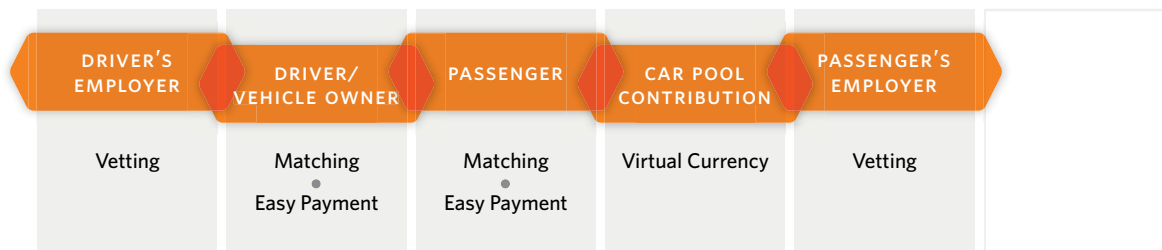
(Image from Viira Cabs' Facebook Page)

customer relations, etiquette, grooming, and even martial arts. Recognizing the potential danger to the female providers, the drivers receive training in self-defense and defensive driving, batons and pepper sprays, and a GPS system in the cabs equipped with panic alerts. Viira’s motor training school also sends graduates to serve in other companies (such as hotel limousine services).

Viira, which means “courageous woman,” was founded by Revathi Roy, a rally car driver turned entrepreneur. Roy plans to expand the service particularly to smaller cities where even fewer opportunities exist for women from low-income households.

More information: www.viiracabs.com

Caronetas Caronas Inteligentes (Rio de Janeiro, Brazil)



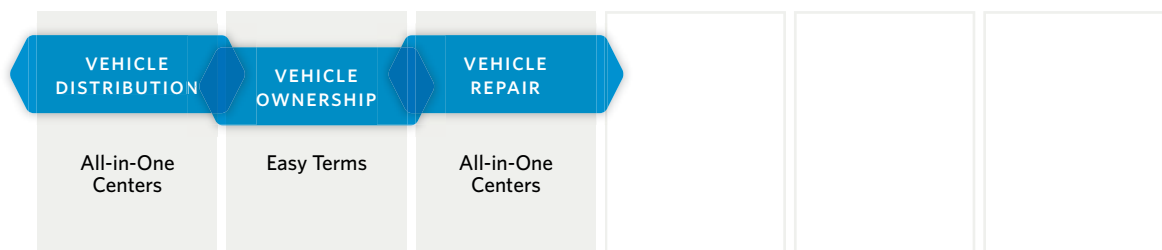
The primary innovation of Caronetas Caronas Inteligentes deals with informal car pool services in Brazil. Caronetas created a virtual currency that allows passengers to participate in car pool services without the need for exchanging (or carrying) cash. Caronetas also increases the trust level in the system by allowing only individuals with valid corporate email addresses to join the system. The virtual currency can also be used in stores and shops.

Caronetas sells the service to Brazilian companies. Companies that opt in must authenticate their employees’ email addresses to use the service,

reducing concerns about safety of carpooling with other unknown passengers. The email certification allows people to ride-share within one company or across multiple companies that have been vetted and authorized employees to participate. More than 900 businesses in Brazil registered for the virtual currency carpooling service during Caronetas’ first year of operation. Based on the model’s initial success, Caronetas now plans to expand operations to Mexico and the United States.

More information: <http://caronetas.com.br> (Portuguese website)

Bicycle Empowerment Centers (Windhoek, Namibia)



The Bicycle Empowerment Network’s (BEN) primary innovation was a scalable and sustainable distribution and service model. BEN distributes bicycles using 40-foot shipping containers that deliver the bikes but also remain in place as community

bicycle workshops called Bicycle Empowerment Centers (BEC). Each shipping container can carry up to 350 second-hand (donated) bicycles, spare parts, and tools. BEN Namibia provides training and



A Bicycling Empowerment Center (BEC) in Okathitu, Namibia.

(Image by Aaron Wieler)

support to entrepreneurs who manage the BEC as well as training and employment for bike mechanics.

While the BEC model does require bike donations on the front end, income from bicycle sales and servicing covers the cost of wages and inventory, ensuring sustainable operations. The program provides entrepreneurship and livelihood opportunities but also makes bicycling a more affordable and appealing option for the poor.

BEN's overall mission includes:

- The provision of affordable and sustainable transport to disadvantaged people.
- The provision of bicycle-related sustainable income generation opportunities.
- The promotion of cycling as a healthy, affordable, sustainable, and dignified means of transport.
- The advocacy of improved sustainable transport infrastructure in Windhoek.
- The promotion of knowledge sharing and networking among the global “bicycles for development” movement, with an emphasis on sub-Saharan Africa.

BEN launched in 2006 and has since deployed 28 BECs (employing close to one hundred people, more than half of whom are women) and sold 23,000 bicycles. BEN is expanding the model to Kenya and Zambia.

More information: www.benbikes.org.za/namibia

Conclusion

The public and private sectors are innovating to meet the transportation demands of rapidly expanding cities, including the needs of the urban poor. However, several challenges should be addressed to take many of these innovative business and service models to scale, including integration and awareness-building among cross-sector leaders.

The new business and service models are breaking new ground and thus typically exist in a gray legal realm. Adding further complexity, regulatory systems do not adequately address informal and para-transit services. The entrepreneurs who enter the space struggle with the lack of regulatory clarity that often leads to uneven enforcement and opens the door to hyper-competition and corruption. Such innovations could benefit from clearer regulations and stronger policy support.

Funders and governments should also find ways to leverage the energy of these emerging innovations. Given the right policy and regulatory frameworks (as well as funding support), the innovations could succeed in improving the working conditions of informal transport workers. New models could increase worker incomes while reducing their working hours and protecting them from health hazards. Open data technology, coupled with enabling policies, could increase transparency and potentially reduce corruption. They could effectively organize the sector and give the workers a voice in policy. More importantly, these new approaches could give households in the sector a viable and powerful pathway out of urban poverty.

Cities in the developing world are prepared to invest massive resources to improve their transportation infrastructure. Those resources could either make urban infrastructure work for the urban poor or amplify and cement the exclusionary forces driving transportation. The next few years will provide opportunities to change the trajectories toward more sustainable and inclusive cities. These innovations could become powerful tools for expanding opportunity and strengthening the resilience of communities.

Appendix: Sources

Expert Interviews:

- O. P. Agarwal, World Bank
- Bert Fabian, Clean Air Initiative, Asia
- Aimee Gauthier, Institute for Transportation and Development Policy
- Cornie Huizenga, SLoCaT Partnership
- Ajay Kumar, World Bank
- Måns Lönnroth, Volvo Research and Education Foundations
- Henrik Nolmark, Volvo Research and Education Foundations
- Edgar Pieterse, African Center for Cities
- Judith Pollock, Shell Foundation

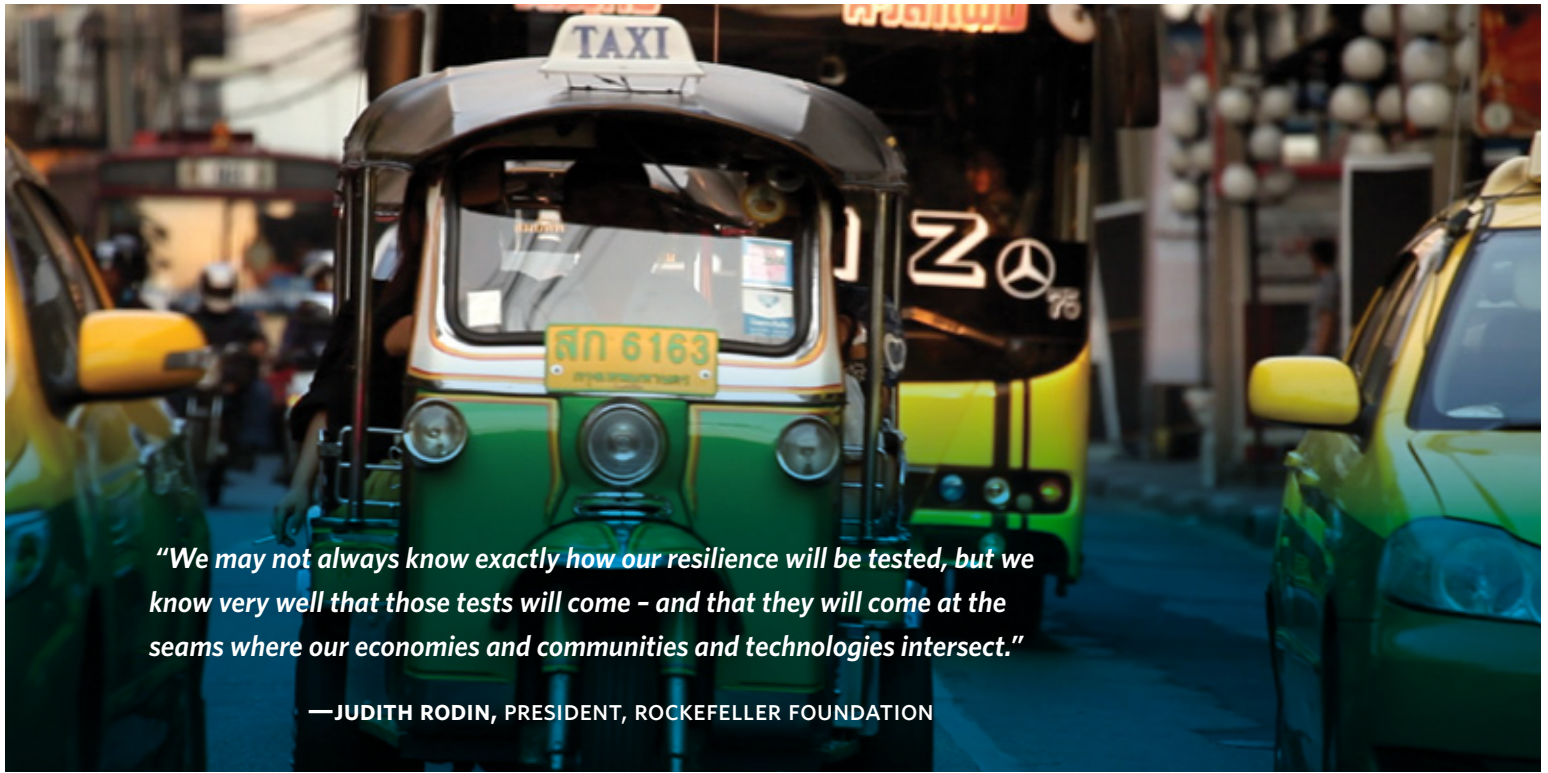
Rockefeller Search Grantees:

- Ateneo School of Government
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- Department of Computing and Informatics, University of Nairobi
- Department of Urban and Regional Planning, Chulalongkorn University
- GroupShot.Org
- Intellectap India Ltd.
- The Sustainable Mobility & Accessibility Research & Transformation (SMART) Initiative, University of Michigan
- World Resources Institute's Centers for Sustainable Transport, EMBARQ India

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"We may not always know exactly how our resilience will be tested, but we know very well that those tests will come – and that they will come at the seams where our economies and communities and technologies intersect."

—JUDITH RODIN, PRESIDENT, ROCKEFELLER FOUNDATION

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