

TABLE 3
Intensity of use of ICTs (focus groups)

ICTs	Ahmedabad	Durban	Lima
Mobile: use in work	5.5	8.5	7.8
Mobile: use in organizing	6.2	3.9	6.7
Internet: use in work	1.3	3.6	2.6
Internet: use in organizing	1.0	1.1	5.7

NOTE: Respondents were asked to rate the importance of mobile and Internet technology on a scale of 1–10, where 1 is not at all important and 10 is very important.

SOURCE: Technology and the Future of Work WIEGO focus groups (2015).

time and money on transportation (Lima, Street Vendor FGs 12 and 16). Mobile phones are used to provide better services. Consider Mario Quispe, who sells vegetables. Mario realized that his regular customers are always in a hurry and have very little time to shop for groceries. So he decided to give his mobile phone number to his regular customers so that they could call him and place an order for groceries. He takes the orders, calculates the cost, and packs the groceries for his clients who drop by to pick up and pay for and their orders (Lima micro-narrative).

Some informal workers use mobile phones to advertise their products or their selling hours. Waste pickers in Lima use mobile phones to generate extra work opportunities: for example, to arrange contracts to use their three-wheelers to transport furniture or materials. A group of waste pickers in Ahmedabad said they listen to the radio and watch television to get information on how to store and recycle waste.

In Lima, there is a pilot project being implemented by the Municipality of Santiago de Surco and a local waste pickers organization. The objective is to enable the waste pickers, who work at night in certain parts of the district, to alert the municipal security force of any incident or suspicious activity that they encounter on their routes. The municipality has created two direct phone lines to its public safety call centre for the waste pickers to use, but only one is free for the caller (Lima micro-narrative).

Ninety per cent of the organizations reported that their organizers use some type of ICTs to help organize members. Two-thirds of the organizations use mobile phones and social media in their organizing work; and half also use smart phones, e-mail/internet and websites as organizing tools. While the majority of membership-based organization leaders surveyed said they found ICTs useful, many indicated that traditional forms of organizing are still important, particularly to reach people in remote rural areas where there is limited mobile phone or internet access or older members who do not use ICTs.

Some organizations of street vendors use mobile phones to warn or inform their members about police raids. A home-based worker in Thailand, a member of HomeNet Thailand, was able to use an app called Line as a source of evidence in court against a subcontractor who refused to pay her for an order. She had received an order from a subcontractor who subsequently refused to pay her for the work done, indicating he

had never placed an order with her. She had received legal training from HomeNet Thailand, so knew what evidence was required to prove the subcontractor had made the order. She could not find any written documents but found text in her Line messages with the contractor that showed that he had in fact placed the order. She was able to use this as evidence in her claim against the contractor.

V. CITY-LEVEL TECHNOLOGICAL SYSTEMS

In developing large infrastructure systems, cities make technological choices that often have major impacts on the livelihoods of informal workers – as does the decision by some cities to privatize these systems. How a city perceives and approaches the informal economy and what a city does in terms of infrastructure services are critical determinants of whether the working poor are able to take advantage of technology. As Richard Dobson of Asiye eTafuleni put it in a key informant interview: *“Provision of infrastructure is a defining pathway for the uptake and use of higher-order technology.”*

In the focus groups, each occupational group was asked to discuss three city-wide technological systems – energy, transport and waste. They were also asked to rank which system had the biggest, medium and least impact on their livelihoods, and whether the impact was positive, negative or mixed.

In terms of *degree of significance*, the city-wide systems were ranked quite similarly across all three study cities. The energy system was ranked as most significant by garment makers in both Ahmedabad and Durban, as most of them use electric sewing machines, and by incense stick rollers in Ahmedabad, who need electricity to be able to work at night. The transport sector was ranked as most significant by street vendors, market traders, market porters and transport workers. The waste sector was very significant to the waste pickers and of limited significance to the other sectors.

But in terms of *whether the impacts were positive, negative or mixed*, the rankings varied a good deal across the study cities, depending largely on the status of the sector in each city, as follows:

a. Energy

There is a national energy crisis in South Africa today, with frequent unpredictable load shedding (deliberate electricity shutdowns) and power outages. This had significant negative impacts on all sectors in the Durban sample. In the focus groups, Durban garment makers reported, *“Electricity is a problem due to the existence of load shedding: while we are in the middle of our work electricity just shuts down”* (Durban, Garment Maker FG 6), and *“Customers blame us for incomplete work when the electricity goes off”* (Durban, Garment Maker FG 8). One focus group of waste pickers reported, *“When there is load shedding, the shops from where we collect recyclable materials close and we do not have access”* (Durban, Waste Picker FG 10). Another focus group of female waste pickers noted, *“In winter, if the street lights are not on, we hesitate to arrive before the DSW [Durban Solid Waste] workers due to the risk [of operating in the dark]”* (Durban, Female Waste Picker FG 11). And a focus group of street vendors observed, *“Electricity is used in the production of petrol. If there is no electricity there will be no petrol; and there will be no transport”* (Durban, Garment Maker FG 6).

Since electrical supply was privatized over 15 years ago, Ahmedabad City has been known for regular electrical supply but high unit rates.

Despite the cost, the regular supply of electricity is a great boon to the home-based garment makers, most of whom operate electric sewing machines, and to the incense stick traders and workers who operate rolling machines powered by electricity. While the supply of electricity is steady and widespread across Ahmedabad City, the presence of street lighting is spotty. One waste picker noted that street lighting along her route helped her sort and collect recyclables during the early morning, while some street vendors compensate for the lack of street lighting at night by running solar-powered lanterns for hours at night. However, alternative energy sources generally require a large upfront investment that is often unaffordable to the poor (interview with McKenzie, Founder of Urban Earth; interview with Solanki, Manager of Torrent Power office).

In Lima, Peru, electrical supply covers more than 95 per cent of households. While the price of electricity rose during the course of the study, market traders and street vendors were more concerned about the rise in gas prices. As a focus group of street vendors observed: *“Almost all the market needs electricity, but as we have it and the prices remain the same, there is no major impact on our work, there are no changes. If we didn’t have it, sure, there would be concerns because without electricity we wouldn’t have water”* (Lima, Street Vendor FG 12).

b. Transport

The lack of affordable and accessible public transport is a key concern to virtually all informal workers in the study cities, as in most cities around the world.⁽¹²⁾ Public transport between their place of residence and place of work tends to be costly, infrequent and unreliable. Moreover, transporting goods on public transport is usually banned. Most informal workers have to resort to private transport of different kinds, or commute and transport goods on foot. The 2012 study by the WIEGO network found that on average, home-based workers in three Asian cities (Ahmedabad, Bangkok and Lahore) spent 30 per cent of their earnings on transport. And of those who spent on transport, one-quarter operated at a loss.⁽¹³⁾

Given the spatial legacy of apartheid in South Africa, whereby the poorer black population still lives in townships at some distance from cities and business centres, transport is a key system for the informal workers in Durban. But public transport in South Africa is inadequate, unreliable and very costly, forcing the informal workers to use private vans and taxis. For street vendors, *“transport is the most important system”* (Durban, Street Vendor FG 3); *“We cannot go anywhere without transport: it is the main key system”* (Durban, Street Vendor FG 3). As one mielie (corn on the cob) cook observed: *“Where we collect mielies is too far; we need a car to collect them”* (Durban, Mielie Cook FG 15). Those who transport goods for other people, use public transport to get to work. As one transport worker in Durban put it: *“If we don’t have transport to come here, we won’t be able to provide for our families”* (Durban, Transport Worker FG 13).

In Lima, public transportation was privatized in the 1990s. Since then, small and medium private companies have provided transport services. The road infrastructure is insufficient, resulting in increasing congestion and chaos. Recently, the government built two subway lines and a metropolitan bus line. However, these investments have proved to be insufficient to meet demand; so a third subway line is being built. Another problem is that the schedule of the trains and buses does not

12. An urban expert in Bangkok refers to the BTS SkyTrain and subway systems as “class-transit”, not “mass-transit”, as the poor cannot afford to ride them. In fact, the poor cannot afford the more informal modes of transport in Bangkok: the two-wheel and three-wheel motorized taxis. The poor tend to walk and take public buses or, if they can save enough money, buy their own motorcycle or car (Apiwat Ratanawaraha. Chulalongkorn University, personal communication, January 2014).

13. Chen, Martha A (2014), *Informal Economy Monitoring Study Sector Report: Home-Based Workers*, WIEGO, Cambridge, MA, available at <http://wiego.org/sites/wiego.org/files/publications/files/IEMS-Home-Based-Workers-Full-Report.pdf>.

meet the needs of informal workers. One waste picker, for example, said, “[The transport system] does not help us. Sometimes the buses do not want to pick us up.” Another said, “Sometimes I might wait until very late [in the night] and they [buses] do not pick us up” (Lima, Waste Picker FG 6).

In all three cities, no consideration has been given to the need of informal workers to transport goods. “Buses are not designed for that sort of carting”, stated a Durban transport planner (Estevez interview). The result is that all informal workers – but especially street vendors, market traders, and waste pickers – have to use taxis, private cars or other private vehicles to transport their goods.¹⁴

Furthermore, urban infrastructure projects, including transport projects, have major impacts on the livelihoods of informal workers. In Ahmedabad, for example, several urban development and infrastructure projects, including a Bus Rapid Transit system (BRTS) (2006), a model roads scheme (2011), a riverfront development scheme (2004), and road widening, have recently been implemented. In the design of these projects, natural (open air) markets of street vendors and the vendors themselves were not considered – with the result that many natural markets have been destroyed or evicted by the Ahmedabad Municipal Corporation. In many cases, the alternate space provided to vendors is not suitable as it does not attract customers.

The implementation of a Bus Rapid Transit (BRT) system is currently in its early stages in Durban. The municipality is aware that the system will realign urban space and potentially disrupt natural markets throughout the city (Estevez interview). With the collaboration of Asiye eTafuleni, a model transport node that incorporates informal traders has been proposed, but whether this will be implemented is questionable (Estevez interview, Dobson interview). Asiye eTafuleni continues to be critical of the BRT system, arguing that it is based on a model that values “frictionless” public transport, which minimizes interactions with public spaces, as the ideal, rather than promoting friction as way to increase economic opportunities (Dobson interview).

c. Waste

Waste management was privatized in Ahmedabad around 2010. Today, the private waste collection covers about 70 per cent of the city (estimate of the Indian Academy of Self-Employed Women). In some parts of the city, the waste pickers can reclaim waste from municipal waste bins. But not all areas have municipal bins, and in some areas that do, the municipal street cleaners or the private garbage workers reclaim waste for themselves.

In Durban, solid waste management is still a public sector function: through the Department of Durban Solid Waste (DSW). One group of waste pickers reported: “The DSW often comes early and takes all the waste including cardboard, so it is important for us that we arrive before the DSW” (Durban, Waste Picker FG 11).

In Lima, solid waste management is a public sector function but the quality of service differs from one municipality to another. A few district municipalities work well with the waste picker associations and include them as part of the waste management system, or provide them with sorting and recycling centres. In other districts, the conditions of the waste pickers are more difficult: the waste pickers have to reclaim recyclables before the municipal garbage trucks collect waste, often having to work at night.

14. In an interview, Gustavo Guerra-García, former Vice Minister of Transport and former adviser to the Management of Urban Transport of the Municipality of Lima, pointed out that the public transport system does not allow transport of goods of any type or amount. Responding to the information found in the study, he noted that specific services would be required to transport goods in the municipality.

Finally and importantly, the focus group discussions during this research, as well as the earlier IEMS research in the same cities, revealed that the unpredictable, often hostile, policy and regulatory environment serves to inhibit the livelihood strategies of informal workers, including their choice and use of technologies. The lack of legal recognition and protection means that informal workers often face demands for bribes, confiscation of goods and equipment, evictions, and other forms of harassment. These inhibit their ability or willingness to invest in improved technologies or enhanced stock. For instance, street vendors without secure vending sites are inhibited from investing in expensive or heavy equipment as they have to be able to pick up and move their equipment and stock when they see the police coming.

Most critically, the lack of a secure workplace and a secure storage space, high costs for permits and rents, and high costs of transport inhibit investments in both technology and stock.

Consider the situation of Benedict Matlalo and other metal scrap recyclers in Durban. The essential tools of their trade, used to break down appliances and other sources of metal, are a hammer, a chisel, a screwdriver or spanner, and a saw. However, possession of these tools – which are essential for their livelihoods – makes them vulnerable to police harassment and confiscation. As Benedict explained, the tools recyclers use in reclaiming and recycling scrap metal are the same ones that thieves use to break into houses. The police therefore assume that they possess and use these tools because they *are* criminals and are plotting to use them to carry out burglaries. This is further aggravated by the fact that their job requires them to walk around local neighbourhoods looking for scrap metal and cardboard, in an environment where there are already heightened fears of crime. The police response is to confiscate their tools or to surround them at the park where they work, forcing them to run off and hide. On occasion, they have even been shot at with rubber bullets: one of Benedict's colleagues lost his eye, but being a migrant he chose not to report the incident as he was afraid of being deported. On other occasions the police have loaded them up "*like sardines*" into police vans, and taken them somewhere to be "*hosed down*", or driven them far away to a dump site, from where it has been difficult to get back to their work site (Durban micro-narrative).

VI. CONCLUSIONS

The research findings presented above shed much-needed light on the reality of work and technology at the bottom of the economic pyramid.

The findings suggest that both existing and emerging work technologies, in all the sectors across the three cities, are quite basic. The study also found that the costs and risks of new technologies are well understood, including direct costs (capital investment, energy requirements, maintenance and repairs, and replacement if broken, lost, stolen or confiscated); lack of necessary know-how or skills to use and maintain technologies; and lack of basic infrastructure services. Other factors are portability (especially for street vendors who have to move on when police arrive) and storage availability (especially for street vendors and waste pickers). Perhaps most importantly, the study found that fear of theft and of confiscation by local authorities are major deterrents to investing in improved technology.

The findings also suggest that informal workers and their organizations are beginning to use ICTs in their work and organizing, but that individual informal workers use mainly simple mobile phones while organizations of informal workers are beginning to use internet and online platforms. But there are limits to using ICTs as many members do not own smartphones, many organizations do not own smartphones or computers, many members are not literate, and many members live in remote areas without internet access. Also, the findings make it clear that ICTs alone cannot address the wider systemic constraints faced by informal workers.

Perhaps most importantly, the findings suggest that city-level systems and city-level policies and practices have a significant impact on informal workers, their livelihoods and their ability to adapt to technological change. An unpredictable, often hostile, policy and regulatory environment serves to inhibit the livelihood strategies of informal workers, including their choice and use of technologies. This reality is summed up succinctly by a street vendor in Lima: *"I sell from a small bag. If I sell more, the municipal police come and seize my things"* (Lima, Street Vendor FG 12).

The available evidence suggests that individual informal workers adapt or invest in technologies to increase productivity and incomes, to address occupational health and safety concerns, and to compensate for wider structural constraints. However, the adaptations or investments are quite modest, as follows:

To increase productivity and income, informal workers use simple mobile phones to contact suppliers, buyers and contractors. As for sector-specific technologies, construction workers seek training in specialized skills and invest in tradesperson's tools; garment workers prefer improved electric sewing machines and specialized gadgets; street vendors benefit from investing in improved displays and digital scales to attract customers; and both street vendors and waste pickers use improved barrows, trolleys and carts.

To address occupational safety and health risks, construction workers weave topknots out of string or plastic to cushion the weight of headloads; market porters use tools to deal with heavy loads, treating boards as ramps to cushion weight when loading/offloading heavy bags or boxes; and street vendors and waste pickers put reflective strips on their trolleys, barrows or carts.

To compensate for lack of basic infrastructure services, street vendors extend selling hours through the use of solar lamps.

Finally, *to compensate for lack of accessible/affordable public transport*, all workers in the studied occupations hire private transport, sometimes jointly.

The evidence also indicates that organizations of informal workers can and do help their members to make technological choices, to jointly acquire expensive technology, and to negotiate the wider environment. Organizations of informal workers help their members negotiate access to raw materials (including waste); workplaces and storage spaces; basic infrastructure services at their homes and workplaces; affordable transport services; permits or licences to work; and contracts to provide public goods and services – all of which make it more likely that informal workers can invest in improved technologies.

To sum up, little is known about the technologies used by the working poor in the informal economy and little attention has been paid to developing technologies for them. Meanwhile, informal workers have been adapting their existing work technologies to match new work opportunities and adapting their existing work to meet new technological

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challenges, but largely on their own in a negative policy and regulatory environment. As one street vendor in Lima observed, informal workers belong to “a different world”: a world that is either invisible to or stigmatized by government, the private sector and the general public. To make technology development more inclusive and just for informal workers, governments and other key stakeholders need to recognize and value informal workers and their livelihoods, and to take them into account – to listen to their needs – when designing not only technology but also city-level regulations, policies and systems.

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