

Technology #52



ver the past few weeks, 16-year-old Esteban Quispe has been making the media rounds. Recently appearing in local newspapers and television programs, he is Bolivia's latest technological discovery. In the unassuming town of Patacamaya, about 100 kilometres southeast of La Paz, Esteban has spent the last several years building robots, largely out of trash.

From his tinkerer's workshop adjacent to his parent's house, Esteban has dreamed up and constructed a family of robots, one with a shocking resemblance to Wall-E, the Pixar robot from the film of the same name. Taking inspiration from the needs around him, he hopes to pioneer artificial intelligence in the future, and to use robotics to help make the work of the farmers and laborers in his community much easier.

The Bolivian altiplano may at first seem an unlikely place for such an inventor. In a community whose economy is largely based on potato cultivation, how does one of its own, the child of a bricklayer and a homemaker, find the passion and the talent for robotics? Truth is, Bolivia today is a hotbed of technology. In recent years, the launch of the Tupac Katari satellite and the completion of the first phase of the Mi Teleférico project (with a second phase on the way) are just some of the more high-profile projects in Bolivia. The national government has even announced the creation of a Technological Citadel, a dream to sow the seeds of Bolivia's very own Silicon Valley, a task for which the State will need to continue improving telecommunications and to move government processes and citizen engagement online.

As these and other initiatives continue to take hold, more and more stories like Esteban's will certainly come to light. Both Bolivians and expats living in the country are realising what this place is capable of in terms of technological innovation, giving more and more people the drive to dream up the seemingly impossible and push forward to make their visions a reality.

Technology likes to cross borders, and this is very apparent in Bolivia. Much of the latest technological changes here have been brought from elsewhere. Facebook has come with a plan to provide free (if limited) internet access across the country. US engineers have implemented ways to use one of Bolivia's most abundant natural resources, llama feces, to filter and clean water (no joke!). And German engineering has introduced new technologies to help mend heart defects among children across the country.

But much of the exciting advances in technology in Bolivia are the result of local inventiveness. There are countless people across the country who, like Esteban, have the drive, initiative and knowhow to offer some pretty impressive technologies. In fact, some homegrown efforts are looking to be exported to nearby countries: Bolivia's RFID-based tagging and registration system for automobiles seems primed for implementation across the continent. And in certain parts of Bolivia, fine examples of traditional technologies, particularly around agriculture and food production, are being brought back into practice as time reveals their usefulness and effectiveness.

In this issue, BX looks at technology and how it is changing and shaping Bolivia. Whether coming from Bolivians like Esteban or from foreigners bringing 'the next big idea', Bolivia is entering an exciting new phase of technological development, and we wanted to capture a snapshot of that process.

With improved telecommunications, more advanced training opportunities and a growing interest in moving Bolivia's tech sector to the global stage, we should expect to see more stories like Esteban's in the future. The most important thing we can do is encourage the curiosity, foster the inventiveness and support the ingenuity that drives these efforts. Only then can Bolivia be brought closer to participating meaningfully in global technological transformation.*

N.B. Several Spanish and Aymara words are marked in **bold** throughout this issue.

Their meanings can be found in our glossary.

By William Wroblewski



















ESCENARIO

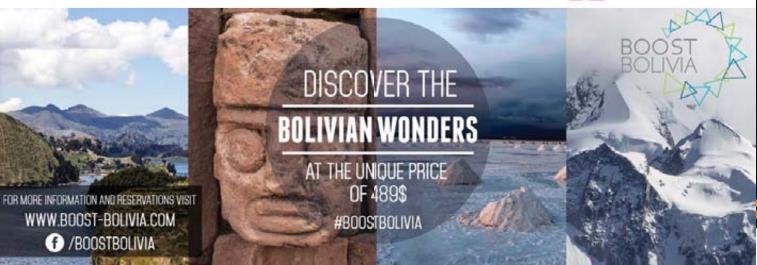
GENERAL















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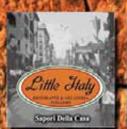


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E-GOVERNMENT AND EFFICIENCY

Bolivia's Bet to Bring Bureaucracy into the 21st Century

TEXT: MAXWELL POPESCU ILLUSTRATION: OSCAR ZALLES

s computer and internet access becomes more widespread, governments across the world are turning to electronic government (e-government) in a bid to improve bureaucratic processes and connect with their citizens. Bolivia is no exception, and next year the Bolivian Directorate of Electronic Government is expected to unveil its implementation plan, which will provide a muchneeded national strategic framework for the future of its e-government.

'Since 2001, Bolivia has been implementing various e-government projects which have allowed the government to reach an E-Government Development Index (EDGI) of 0.45 in 2014,' says

Noelia Gomez, a researcher for the Social Investigation Centre of the Vice Presidency.

The EDGI, as published in the UN E-Government Survey, is a measure of how advanced a country's e-government is, based on three things: provision of online services, telecommunications infrastructure and human capital. Placing 103rd out of 193 in the survey, with an EDGI slightly below the world average of 0.47, Bolivia is lagging.

One e-government project that helped raise the EDGI is the digitisation of personal identification cards. Prior to this, identification cards were issued by the police, who kept paper files that were not linked to other cities. It was later discovered that the police had

issued over 400,000 duplicate identification numbers, resulting from the lack of centralised information.

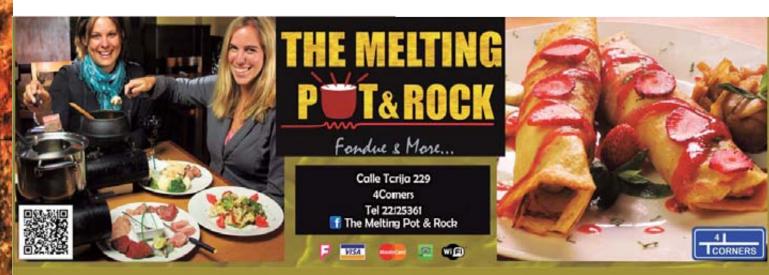
In its simplest form, e-government transforms old, paper-based administrative procedures to an electronic form and improves efficiency within government. However, for many Bolivian citizens, the benefits are not immediately obvious.

In La Paz, the municipal government has developed an online portal (www.lapaz.bo) that gives citizens of the city access to various online services. For example, a construction contractor can obtain a building permit by completing several steps from the comfort of his own computer or at a multipurpose service point in the city.

Elsewhere, the availability of such services is almost nonexistent. In Bolivia, many people do not have internet, so these services are only for some people,' Gomez explains. 'Most of the internet is in cities, and not in rural areas.' On a national level, introducing online services for citizens makes little sense unless the telecommunications infrastructure is improved.

Gomez then raises the issue of human capital: Even among the people that can access the internet, many stick to pen and paper as they aren't comfortable using the technology, or do not trust it.' South Korea, which tops the UN E-Government Survey, began implementing major programs for training and promoting the use of information and computing technology over 15 years ago, highlighting the long-term nature of any resolution.

An ambitious e-government implementation plan will form the basis of e-government projects over the next five years. Electronic programs for health, education and citizen participation are on the agenda, but is Bolivia ready to embrace the digital age? Only time will tell. *



JUNK DRAWER OR TREASURE CHEST?

PHOTO: 7200.LineaRect

he Feria 16 de Julio, held in El Alto every Thursday and Sunday, is one of the largest markets in Latin America, if not the world. Less than a single destination, it is more a cluster of neighborhoods transformed into a cacophonous jumble of stalls and stores, selling anything shoppers desire.

Some vendors sell new merchandise, from bathroom supplies and home goods to hand-crafted beds and dressers. But much of the market is a flea market that dreams are made of, a heaven for anyone who can't get enough of chari-

ty shops and rummage sales. Shoppers can easily spend the day walking for kilometres, searching through mountains of used clothing, household goods and electronics.

Knowing that this was the place to discover technological gems from bygone days, BX sent the team from 7200.Linea-Recta to hit the streets, dig through the piles and unearth what was buried.

These are some of their favorite finds. - ed.*





TEGETIOLOGY TEGETIOLOGY



CONNECTING TO THE WORLD

FACEBOOK PROVIDES FREE INTERNET ACCESS IN BOLIVIA — BUT IS IT ENOUGH?

TEXT: LAURA CHITTY

n June 18, 2015, the Bolivian telecommunications company Viva joined with internet.org, a project set up by Facebook founder Mark Zuckerberg in 2013, to provide all users of Viva's network access free basic internet services, including Facebook, Bing, Wikipedia, UN Women and a local news channel. Bolivia joins 13 other participating countries, including Tanzania, Bangladesh, India and Senegal. In 2014, only 40% of Bolivians had access to the internet, so this program could benefit a majority of the country's population.

I asked the president of Viva, Juan Pablo Calvo, about the impact this project will have in Bolivia. 'Viva has one goal: increasing access to telecommunication and improving the lives of people in Bolivia,' he explained. 'Internet.org helps people become involved in the digital world. Our aim is to get more and more people connected.'

To access internet.org, customers simply need to have a Viva sim card and a phone that can access a 2G, 3G or 4G network. Then they have to download an app that allows limited internet services completely free. The goal is to eliminate all barriers facing a user who does not use the Internet, Calvo explained. They can then discover how useful the internet can be.

Zuckerberg describes the mission of internet.org as 'making the world more open and connected'. To achieve this, Facebook is also developing unmanned aerial vehicles and satellites to bring connectivity to remote areas without cellular coverage.

But some people have argued that this service is not as useful as it first seems. In May of this year, 67 digital organisations

around the world sent an open letter to Zuckerberg describing the project as 'a violation of neutrality, freedom of expression and equality of opportunity'. They argue that only a few companies, Facebook included, stand to benefit from the service, and therefore it does not show people the real benefits the internet has to offer because it is so limited.

But others say that some internet is better than no internet. Calvo also told me that in Bolivia, things will be done differently than in other countries. It is important to clarify that it is not a closed list [of accessible websites] here,' he said. We want it to expand. The idea is to include more content from Bolivian developers, like Cómo Llego, which is a site that provides information about public transportation in La Paz and is now part of internet.org. This site was developed by four Bolivian students and is being expanded to provide information

on other cities.'

Despite arguments against internet.org, it is still an opportunity for people in Bolivia who have not had access to basic internet services. Calvo's final thoughts described exactly how big this mission is: 'Bridging the digital divide is a task for all and an ambitious mission. Everyone needs to be involved.'x





CONNECTING THE DOTS

THE LARGEST CABLE CAR SYSTEM KEEPS GROWING

TEXT: MARINA POOLE

PHOTO: JENNIFER SIMÓN VIZAN/7200.LineaRecta

he Mi **Teleférico** system, connecting the areas of La Paz and El Alto, is the most extensive urban cable car system in the world. Its three operative lines impressively cross over the mountainous city, cutting an hour-long commute by land to El Alto to an enjoyable 15 minutes of astonishing views.

Soon, this already-impressive network will expand to new reaches of the city by adding six more lines at a price tag of \$450 million. The completion of this second phase will add 20.3 km and 23 more stations to the system. Riders will be able to travel all the way from Cota Cota in the Zona Sur to Río Seco in El Alto.

The six new lines are to be built by 2030, with the new White Line due for completion in less than a year. The system will make the face of the city one of modernity, technology and color, says César Dockweiler, executive manager of Mi Teléferico. The expansion will not displace buildings or affect many trees in the city. Only 12 of 500 trees at the Plaza Triangular in Miraflores, for example, will be affected by the project. It will also generate jobs in La Paz, as the company, with 150 employees at the moment, expects to employ around 800 people in the future.

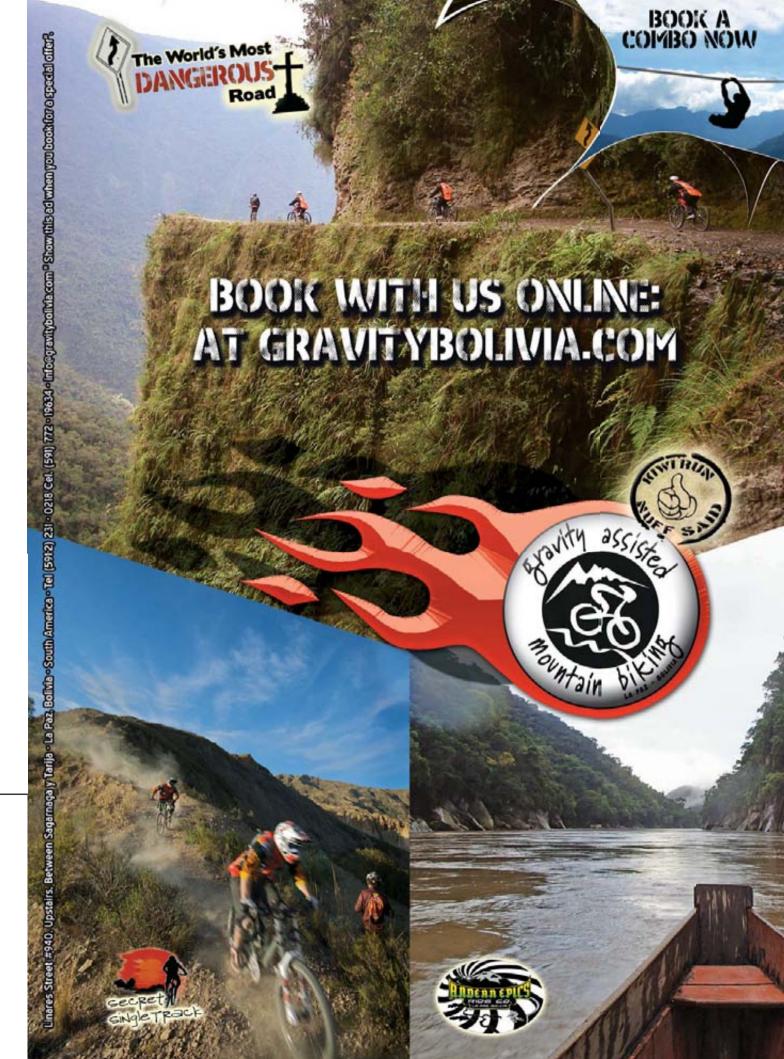
Dockweiler explains that this expansion will make green areas and plazas more accessible,

improving the ecological and social well-being of the city. We are not enemies of the plazas,' Dockweiler says. In order not to disturb Plaza Triangular, the new White Line will feature the world's first underground **teleférico** station. This line will connect the most frequented parts of La Paz, travelling from Chuqi Apu (where Yellow and Green currently meet), to the future Orange Line, where one will be able to connect to the Red, which is currently isolated from the existing lines.

Beyond this expansion, Dockweiler envisions a future of integrated transportation systems for La Paz, which will ensure that the future city will be 'a city for living, a city for coexisting, a city for enjoying.' *







PARTS FOR HEARTS

Aymaran Women Knit Technology to Fix Birth Defects

TEXT: KINJO KIEMA
PHOTO: JOSE CARLOS VELASCO

he most complex problems need the most simple solutions.'

This has become Franz Freudenthal's mantra – the biggest lesson he took from his grandmother's life – and a concept that inspired him to invent the Nit-Occlud device, a piece of high-tech medical equipment that is hand-knitted by *Aymara* women. With this technology that meshes ancient weaving traditions with medical innovation, there is a new way to save the lives of many children in Bolivia and around the world.

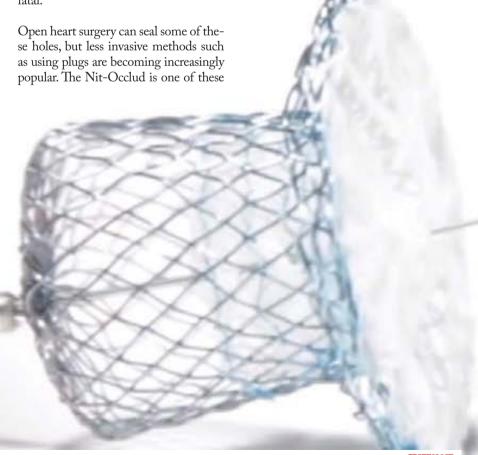
Freudenthal and his wife perform operations at the Fundación Caridioinfantil in La Paz, which was created to help poor children with heart diseases. The Foundation has helped 350 children since it began the operations in 2007. The Nit-Occlud devices are designed to block holes in a human heart that are a result of a congenital defect, the most common birth defect worldwide, affecting around one out of every 500 babies.

16 📻

The causes of these defects are generally unknown by doctors, although smoking while pregnant and genetic disorders – like Down syndrome – can contribute to the defect's development. Heart murmurs often indicate the presence of a hole in the heart, and around half close on their own. But for the remaining children with this condition, a repair is necessary so they can lead healthy and productive lives. Untreated holes can be fortal

plugs. Attached to a disposable handle and catheter, it is hand-knitted into the shape of a coil, like a tiny top hat.

But producing such sophisticated medical equipment by hand is is problematic because consistency in construction isn't as stringent as one finds in a modern factory. Additionally, Bolivia lacks in te-



chnological development, making the production of a high-tech product that much more difficult.

'The idea of knitting them by hand was to improve the devices already on the market, which are made of wires that are soldered shut,' says Freudenthal, explaining that a seamless single-wire device had to be constructed by hand, rather than by machine.

'Hand-woven is more difficult and therefore more expensive,' explains Freudenthal, but it's less risky for the patient, and Freudenthal says they are primarily 'interested in the life of the patient.'

Although the women fabricating these plugs have likely been lifelong knitters, they receive training for three to four months once they are hired. This not only includes learning how to weave the parts together, but also learning how to understand difficult technical language and documents, which not only gives them the necessary skills to do the job but also gives them 'more self-confidence and makes them grow professionally,' according to Freudenthal.

The clinic pays the workers a stipend during training, and they are also trained in hygiene, safety, teamwork and conflict management, making them ideal employees for a high-level manufacturing environment. The manufacturing company PFM SRL considers this training a social contribution because 'investing in quality training produces a quality product. 'The company's management also believe that 'any adult who contributes positively to society must receive compensation' as well.

'Hand-woven is more difficult and therefore more expensive.'

— Franz Freudenthal

The procedure costs several thousand US dollars, but is vastly cheaper – and less risky – than traditional open heart surgery. However, Freudenthal says that 'it should be emphasized that not all patients can be treated with devices – some need surgery to survive.'

The Foundation supports itself via donations from Austrian and German individuals, and they are also assisted within Bolivia by Bisa Bank. Although some families are able to afford the procedures, many are unable to and have to fundraise or get assistance from the Foundation if they have no means of paying.

The Nit-Occlud is wholly manufactured in Bolivia and exported to Germany, where it is certified and exported to the UK, Russia, Kazakhstan, Spain and other countries.

Not only is the foundation's invention improving the lives of children with heart defects in Bolivia and around the world, it is also providing unique job training and employment opportunities for women. *

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anatomy of an Eco-Farm

ORGANIC FOOD IN ACHOCALLA

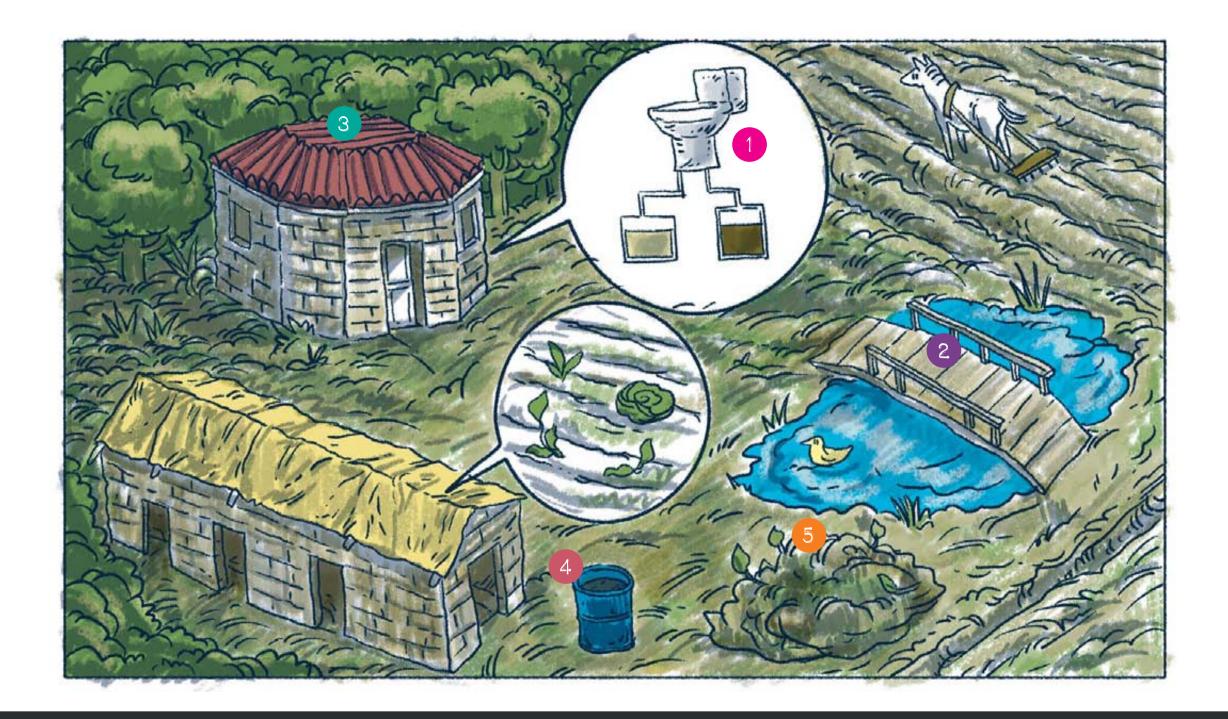
TEXT: MARINA POOLE ILLUSTRATION: OSCAR ZALLES

n Achocalla, farmer Telmo Nina shows me around the eco-farm he manages. He explains how each component of the operation has multiple benefits for the land and the grower, and exists in nearperfect equilibrium with the natural environment. From here, Nina and his team grow over 49 varieties of vegetables for Armonía restaurant in Sopocachi, and for distribution throughout La Paz.

Nina shows-off innovative techniques for working with the land, instead of contaminating and depleting it, resulting in overall-healthier systems. The soil is at the core of everything he does at the farm. His sowing, cultivating and harvesting methods rely on healthy "living" soil free of chemicals and pesticides.

'A plant [in this soil] has the advantage of being able to fight off diseases because it is well-powered,' Nina explains, picking up a handful of compost. It's like a person. If you are well fed, you're strong; you don't get sick, you don't catch a cold, nothing. But if you're weak, if you don't eat well, you'll suffer from illness, stomach ache, etc.'

In the following image, we point to five features of Nina's farm that make it sustainable. These sustainable technologies help provide healthy vegetables to the city.



Inside the adobe country house is an ecological bathroom that reduces the footprint of the home. To use it, visitors follow posted instructions to sit correctly on the toilet so that urine is caught separately from waste. After use, one simply dumps some of the "or-ganic material" on top of the waste in order to mask the smell. Remarkably, there's no smell whatsoever! Urine is used to enrich soil outside and Nina is testing the use of the waste for large inedible plants on the property.

In order to maintain warmth in the harsh frost season of the Altiplano, it's important to cultivate next to water, like the Incans did. Canals are dug around fields and inside greenhouses for this reason.

Artificial ponds also regulate temperatures, as well as support life in the ecosystem. 'This creates a home for little birds and ducks,' who move in on their own, Nina explains.



'In the countryside people can live off of energy completely free,' Nina says of their solar lamps.



Nina's team and a local university experiment with biogas, a liquid byproduct of treated manure. The odorless black liquid looks more like fuel for your car than something you'd trust to fuel your food, but there's no arguing that the plants given this treatment grow taller than the others.



compost PHES:

'We only need natural materials for the compost,' Nina says. 'We have regular sand and we use it to cap off the first layer of organic material. Then we put another layer of the organic material and add natural sheep manure. Next we need a little bit of carbon - normal coal which we always have All of the coal, which we always have. All of these materials are at hand on the farmland. Finally, we place dried reeds on top to protect the compost like a skin, and the land does all the work.

SHADES OF GREY

BOLIVIA'S MARKET IN UNAUTHORISED ELECTRONICS

TEXT: Fergus Morgan
ILLUSTRATION: OSCAR ZALLES

n a world where Apple, Sony and Samsung are worshipped as deities, Bolivia is a God-forsaken place. There is a distinct dearth of certified dealers – Apple has no official store in the entire country – and the only viable means of obtaining a smartphone through authorised channels involves ruinously expensive mobile phone contracts.

Buying online from abroad is no solution, as import costs for electronics are expensive and Aduana Nacional, the national customs authority, is known to be slow and bureaucratic. On top of this, there are notoriously long waits for home delivery and the arrival of products several months after purchase is not uncom-

mon.

It is not the same elsewhere. In the US, one can walk into a store and come out with an armful of electronic devices, ready for use, at much lower prices. An iPad Air 2 can be found for \$629 in the US. In Bolivia, the same model would cost over \$1000.

Some people in Bolivia see this frustrating situation as an opportunity. Those acting legally bring items from the US, stomaching the costs to get them here,

and still manage to sell them at a profit. Those acting illegally circumvent customs entirely. Both operations are part of what is known as the 'grey market'.

Unlike on the black market, selling goods on the grey is not technically against the

rey market'.

market, selling echnically against the The Aduana airport is clustered content impossigned to a legaction waiting for customs. On

law, as the items themselves are not illegal. After all, smartphones and laptops do not pose as obvious a threat as weapons and drugs do. Despised by manufacturers and service providers alike for its potential damage to their reputation, the grey market is unofficial and unauthorised, but fundamentally within the law.

This unofficial business is booming in Bolivia and elsewhere. Conservative estimates in a study by KPMG place the value of computer electronics in the global grey market between \$20 billion and \$40 billion yearly, with South American markets being amongst the largest in the world for these products. According to the World Bank, in 2004 Bolivia's informal economy, which comprises the grey market and other unregulated sectors, constituted 67.1% of the country's gross national income, compared to a global average of 32.5%.

The Aduana Nacional office at El Alto airport is cluttered. The air is dusty. Discontent importers sit in a waiting area, resigned to a lengthy delay. Some have been waiting for weeks to get items through customs. One man, who merely wanted to bring in 1kg of dish detergent samples, has been waiting for twenty-one

Another, Jesus Chavez, who imports computers legally from Miami, has been red-flagged by the customs office but doesn't know why. After two years in the business, grey market importing has become his main source of income.

Jesus' concerns are familiar. He says Aduana Nacional is incompetent, the process is inefficient, and the time taken to nationalise imports can be incredibly frustrating. He tiredly asserts that, all too frequently, it's not at you are bringing in, ou know in the customs

what you are bringing in, but who you know in the customs

There is, of course, the illegal alternative, which Jesus is unwilling to explore. It is with undeclared importation that the grey market strays into illegality.

Customs laws dictate that only personal devices can be brought into Bolivia

for free; for everything else, charges, sometimes extortionate ones, apply. Circumventing these charges is simply a matter of persuading officials that the items being imported are for personal use. With sizeable shipments of computers this is understandably tricky, but with smaller shipments, phones and tablets stuffed into suitcases for example, the possibility of bringing them into Bolivia under the radar, without paying any duty at all, is tantalising.

"CUSTOMS HERE IS TERRIBLE. TERRIBLE, TERRIBLE."

Though illegal, undeclared importing is not always the shady, dangerous business one might imagine. Anyone in Bolivia who regularly flies abroad will attest that access to the US market means being inundated with requests by friends and family to bring back smartphones, or tablets, or laptops. It does not take long for them to realise the economic potential.

One individual who seized this opportunity is Margaret (not her real name), a working single mother living in a small apartment in Zona Sur. She is friendly and open about what she does – less of a criminal than a hardworking woman trying to keep her family afloat.

Like many, the money Margaret earns importing is an enormous help when times are tight. I work in consulting usually', she says, 'but when there aren't any jobs, the money I make from bringing things back from the US is really, really helpful. It's enough for a month's living costs.'

I have been afraid going through customs before with so many different things,' she admits, 'but I have never felt guilty, because customs here is terrible. Terrible, terrible, terrible.'

Margaret is determined not to push her luck. 'There are some people with offices, who import things illegally as a career', she says. I remember one man tried to bring \$50,000 of electronics back in a suitcase, and he was caught.'

Whether people do it as a career or a side-job, grey market importing (both legal and illegal) represents an estimated \$1.2–4.8 billion annual loss to manufacturers and authorised distributors across the world. To combat this growing threat, leading American technology companies formed the Alliance for Grey Market and Counterfeit Abatement in 2001, which is still active today.

The Alliance aims to counter large-scale importers in the grey market, but it does not seem worthwhile to spend resources tackling small-scale importers like Margaret who, individually, hardly pose a threat to global corporations. Cumulatively, this prevalent practice might affect corporate profit margins, but the truth is many importers keep things modest, bringing back only what they need to sustain their standard of living.

'I could charge more, and bring more back, but then it is more of a risk', Margaret confesses. Twe never been in trouble because I never bring back too much. I'm not greedy and that's why I'm successful.' *



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n many areas of Bolivia, particularly the most rural, breakfasts consist of a simple offering of tea and bread. Different areas tend to have their bread of choice: marraquetas (similar to a sourdough roll), allullas (a round flat roll) or even industrial sliced-white, to name but a few.

To some, bread is a simple concept: flour, water, yeast, salt. Not much to it at first glance. However, look a little deeper and you'll discover that for many, the act of making bread is either an art or a science, or both.

In recent years, there have been untold technological advancements in the culinary field, but to what extent does this affect the quality of the end product? Can a 'super oven' with a built-in boiler and countless complex settings really produce a higher-quality product than the simplistic technology of a woodfired oven? Where do we draw the line between efficiency and the artisanal? Let's make this a good clean fight: technology versus tradition - who'll come out on top?

Alvaro Manuel Sanchez, 25, is the man to see about the latest in baking technology. Sitting in a shop on El Prado, surrounded by a plethora of gleaming modern ovens, he chats with me about what makes his prize offering, the Advance Plus, so impressive. Sanchez claims that a specific feature of this oven, its builtin boiler, is what makes it stand apart from traditional ovens that struggle to create the humidity necessary for making good bread. Those that use a pan of boiling water to create humidity have found an answer,' he says, 'but it's not the optimal one.'

He goes on to describe the seemingly endless list of impressive features the oven has before we get into the nittygritty. Clearly, there is some scepticism surrounding the considerable price of the oven itself, as for many it would be a huge investment. Sanchez assures me that the immense capabilities, efficiency and speed of this oven can reduce personnel and increase productivity, and as such the initial investment is returned rapidly. 'You're going to double your productivity, you're going to sell lots more', he says. If you have around eight people working in your bakery, you're only going to need five or six.'

Meanwhile, in Laja, a pueblo outside of La Paz famed for its delicious artisanal flatbread, things are very different. Gustavo Naruaez and a select few lajeños are keeping things traditional by following an old recipe using a wood-fired oven. The oven itself is simple in design, made from bricks with sand placed under its floor to keep a steady temperature and kept burning with scraps of wood. When asked about the importance of the oven, Gustavo says that a more sophisticated oven would detract from both the flavour and the very essence of his bread, saying, 'It wouldn't be pan de laja anymore.'

While everyone carries out their individual roles – stretching the bread, stoking the fire, introducing and removing the bread - the oven churns out batch after batch of perfect flatbread, filling the room with an intoxicating freshly baked

After an hour with Gustavo, it is clear how important his team is to him. This could be because his team is made up of his family: both his son and daughter work at the bakery, making for a very proud father. He goes on to tell me with great satisfaction that they sell enough bread in Laja to not need to offer it anywhere else.

Finding a balance between artisanal practices and technological advancements will always divide opinion. It seems clear each of these ovens serves a purpose in its own field. One being much more industrial, with a desire for uniformity and precision; the other more traditional, family- and flavour-focused. It's for each business to decide which route they take in this ever more mechanised world. Art or science? Technology or tradition? The choice is yours. *



TOILET TROUBLES

DON'T FLUSH THAT TP

TEXT: KINJO KIEMA PHOTO: 7200.LineaRecta

hen I first arrived in Bolivia, I constantly forgot that I wasn't supposed to flush toilet paper down the loo, like at home. At first, I thought it might just be a cultural norm, but when I looked into why you have to throw after you go, I found out it's for a different reason.

I talked to Enrique Torrezo, an employee of Bolivia's Ministry of Environment and Water, about why toilet paper just isn't flushable.

'We have information that toilet paper that is manufactured here isn't of the quality of that manufactured in other places,' said Torrezo, 'like in the United States, where the paper is designed so there aren't any problems.'

Toilet paper in countries where flushing it down is the norm is designed to break down once it is flushed, so it won't cause clogs. However, most of the toilet paper used here - particularly the brands that are cheapest - are made of more fibrous material that won't disintegrate fully once down the drain.

Blockages from toilet paper are actually uncommon here. In public places such as restaurants, hotels and schools, people tend to heed warnings not to flush toilet paper after completing their business. Real problems arise, Torrezo says, when people flush worse things down the drain, like sanitary pads and diapers.

Fortunately, the city of La Paz has installed cameras in the plumbing system to spot clogs and to direct some lucky workers to go clean out the mess.*



lab back in Virginia, a team led by Lt. Col. Tim Moore developed a system that turns llama manure into charcoal, which can then be used to remove dissolved metal impurities from water.

'This is a really good field to pioneer in because it's not really one that a lot of people think about,' VMI senior Peter Buehlmann told a Virginia Public Radio Show in May. 'Using waste to clean waste is the quintessential definition of sustainability.'

This summer, VMI volunteers will return to Pampoyo to test out this revolutionary method of water filtration. The good news is, there are more llamas in Bolivia than in any other country, so if the project proves successful, there is plenty more raw material for expansion.

22 = 23



rriving at Radio Atipiri (840 Khz AM) in El Alto, there is a focused silence over the building; everyone is speaking in hushed voices and keeping as quiet as possible. People are broadcasting at this very moment. Apolonia Cruz Escalante, a 19-year-old uni-

versity student, is busy producing a radio talk show, managing the mixing board with the calm professionalism of someone who has spent years methodically learning the ropes. It is now second nature to her. She queues jingles, fades adverts in and out, and is not at all fazed by my presence—nor the incredibly intrusive camera lens pointed at her.

While waiting for Apolonia to finish, I chat to Jobana Aruhiza Tola, who is wearing a red puffer jacket, jeans and trainers. She is now in her second year studying social communications at university. Jobana, who is also 19, has long dark hair and an infectious smile. She says that she became involved with radio when she was only six years old, after hearing an advertisement aimed at children interested in getting involved in the radio business. Despite being nervous and 'a shy introverted child', she was convinced by her father

'IT'S NICE TO LOOK BACK ON HOW LONG I'VE BEEN COMING TO THE RADIO—IT'S LIKE MY SECOND HOME.

- APOLONIA CRUZ ESCALANTE

to not waste time just sitting at home and go and see what radio had to offer. She recalls how vocalisation classes and learning to talk into microphones helped boost her confidence: 'It's just a question of losing the fear.'

Jobana tells me about Pamela, a teacher at

the station when she was a young girl who was an inspiration to her. 'Pamela was always so passionate and took an interest in our lives too,' Jobana says. 'I've always said I want to be just like Pamela.'It is this eagerness to emulate her mentor that has fuelled Jobana's desire to learn as much

> as she can about the radio industry and communications.

When Apolonia and I chat, she comes across as your typical 19-year-old girl: She loves almost every kind of music - except rock! She lives with her parents in the 6 de Agosto area of El Alto, and would probably blush profusely if boys were brought up. However, when we talk about the radio business and the experiences she's had whilst working at Radio Atipiri, her passion is contagious. 'It's nice to look back on how long I've been coming to the radio,' Apolonia says. 'It's like my second home.'

how to use the radio effects.' Despite

the step-by-step instruction, she struggled to understand it all. Now, however, she manages everything well and only stumbles in scenarios where things get especially complicated, like when she has to operate adverts and effects at the same time as talking. 'You don't know which to prioritise,' she says, no-

Apolonia is also interested in the more technical side of the things. 'It's important to manage both the technical and informative side of the radio,' she says, recalling how overwhelming all the technology seemed when she started there and 'a technician came to explain

put into practice what we learn at university.' As long as the radio station stays open, they'll continue to participate. Both confessed dreams of having their own station, although Jobana is more interested in television broadcasting. Apolonia also adds that she's 'more interested in serious things' and aspires to be a journalist or a news producer at a radio station.

ticeably a little flustered by this.

When asked to reflect on their experience at the radio and where they see their futures going, both Apolonia and Jobana light up. After almost nine years of involvement in the radio, they

have a lot to say about what their experiences have taught them. Apolonia remembers being in-

credibly reserved and quiet at both school and home, and she says that working at the radio station has changed her markedly. 'I'm more confident,' she says. 'Now when I come home

from school, I tell my parents everything. It makes them very

now involved in their own show,

des a mixture of radionovelas,

Currently, both Apolonia and Jobana are studying social communications, in which they are learning interview techniques, radio presentation and television news. They both have big aspirations for the future and see themselves at an advantage compared with their classmates

music and news.



26



FLOR DE LECHE

AN ORGANIC DAIRY THIRTY MINUTES FROM THE CITY TEXT AND PHOTO: MARINA POOLE

he quiet town of Achocalla, 12 kilometres south of La Paz, offers an opportune breather right when the city begins to feel hectic. Take a daytrip to enjoy telephone wire-free views of Illimani, paddle-boating on a lagoon or tasting fresh cheese, made locally.

For the past five years, the Municipal Organic Assembly of Achocalla has worked to transform the town into a chemical-free zone. Flor de Leche, a local dairy, has long preceded the initiative, however. The Belgian-Bolivian couple who run it spearheaded artisanal cheese-making in Bolivia 17 years ago and has since been working with locals to create fresh organic dairy products, as well as to introduce a culture of fine aged cheeses.

'One of the most important things the people of Achocalla rely on is milk,' explains Daniel Guaraya, who works at the dairy. 'We have to be very careful to avoid contaminating the water,' he says, because it can lead to milk impurities. The quali-

ty of the milk can also be affected by an infected udder, or become acidic from dry grazing-land. Due to the altitude, however, the milk in Achocalla has a high fat-content, which makes it ideal for cheese-making,

Once past screening at the dairy, the milk travels to the pasteurisation tanks. Every day, about 3000 litres of milk are heated to 72 degrees centigrade, killing the thousands of microorganisms they contain. But the real magic happens after this process, when the milk is mixed with various powdered animal rennets, giving each cheese its character. Just a few grams of rennets is enough for this whole cistern to turn into something like a gelatin, Guaraya tells me.

Next, in what looks like a giant metal kitchen-mixer with a large knife-edge, the curdle is cut to different levels of coarseness, depending on the cheese type. If we're making a soft cheese,' Guaraya explains, 'the cut doesn't need to be so "mi-

llimetric". The dry cheeses, however, need to be processed further in order to separate the whey from the curdle. Whey contains 50% of the nutrients in milk and is great for intestinal health, so the conscientious neighbors return it to their milk providers. Each cheese is brined, shaped and aged in a room according to its variety. By the intense smell in some of the cellars, it's no wonder they must be aged separately to prevent contaminating the distinct flavors.

I leave the cellars of Flor de Leche impressed by the work of these artisans. Their craft helps maintain this well-connected, well-educated and healthy community. Now I am ready to dig into some lunch!

The dairy opens its doors for generous lunches of pizza and fondue every Saturday and Sunday from 12:30-16:00. For more information, call 22890011 or go to www.flordeleche.com.*

For more about sustainable initiatives in Achocalla, see page 18–19.

TECHNOLOGY





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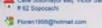
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eople hop on a bike for many reasons, but very few do it to power their business. In Bolivia, small entrepreneurs are cycling away on stationary bikes to make soap, smoothies, coffee, even to charge mobile phones. In Cochabamba, this technology – called "bicimaquinas" – is being used to make ice cream. While on a visit, I met Andrea Vidal, a young volunteer from California, who is trying turning a workout into fresh ice cream.

'Bicimaquinas are seven times more

efficient than using your arms,' she explained. 'They mean you don't have to use expensive technologies like solar panels and gas for energy. It's a way of developing rural communities because it's something almost anyone can create. In this way, it builds the economy.'

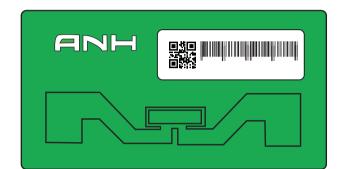
A happy cyclist pedals away on a stationary bike, turning the gears and the blender. Seems simple, doesn't it? However, it's not as easy as it seems. As Andrea explains, 'it's mostly trial and error because it's such a new con-

cept in Bolivia. Only a few small organisations offer this technology'.

In Cochabamba, her main challenge is getting a hold of the right resources. 'There isn't a practice of bike recycling here,' she says. 'People would rather leave a bike rotting in the backyard, instead of donating it to an organisation that makes Bicimaquinas.'

It seems like in this case, the technology is simple, but the implementation is not.*

CRUISE CONTROL



IS THE GOVERNMENT'S HI-TECH FUEL-TRACKING SYSTEM WORTH DRIVERS' PRIVACY?

> TEXT: MAXWELL POPESCU PHOTO: WILLIAM WROBLEWSKI

t a gas station in the working-class neighborhood of San Pedro in La Paz, Diego Castro fuels up his Ford Explorer. Simultaneously, his location, purchase volume and presence on camera are being uploaded to the National Hydrocarbon Agency (ANH) headquarters.

Facilitating this is the Bolivian Auto Identification System (B-SISA). Launched by the ANH in 2013 to combat fuel smuggling, B-SISA is responsible for monitoring and controlling all fuel sales in the country. In Bolivia, the gas is subsidised by the government, so naturally some people will see an opportunity to sell it [illegally] in other countries,' explains Einard Joffre, director of information and communication technologies at the ANH, who is responsible for B-SISA's implementation.

In order for B-SISA to function, registered vehicles are required to have a green adhesive label placed on the windscreen. Within this small, inconspicuous sticker lies a radio-frequency identification (RFID) tag. When the vehicle pulls up to a gas station, the RFID antenna in the station emits a signal which brings the tag to life. The tag then identifies its vehicle to the system and the sale of fuel is authorised, while relevant data is recorded in a central database.

Unusual activity does not go unnoticed. 'We recently identified nine different vehicles in Oruro purchasing nearly 20,000 litres in one month in different gas stations,' Joffre says. Whether or not the purchases were legitimate is still under investigation.



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One might wonder whether the Bs100 million cost of B-SISA is really justified. While recouping the costs of illegal trade of fuel alone could outweigh the program cost,

It is not a bulletproof fix to car theft, as the artful criminal might avoid gas stations or completely dismantle the vehicle for parts. Nevertheless, it has the ability to signifi-

'I AM SURE THE INFORMATION COULD BE USEFUL, BUT FOR ALL I KNOW IT COULD BE USED FOR ABSOLUTELY NOTHING.' - DIEGO CASTRO

Joffre explains that the system brings many other benefits to the state. We work with many institutions,' he says. 'Because of the law it is our duty to share the information [from the system] with government ministries and the police.'

The Vehicular Theft Prevention De-

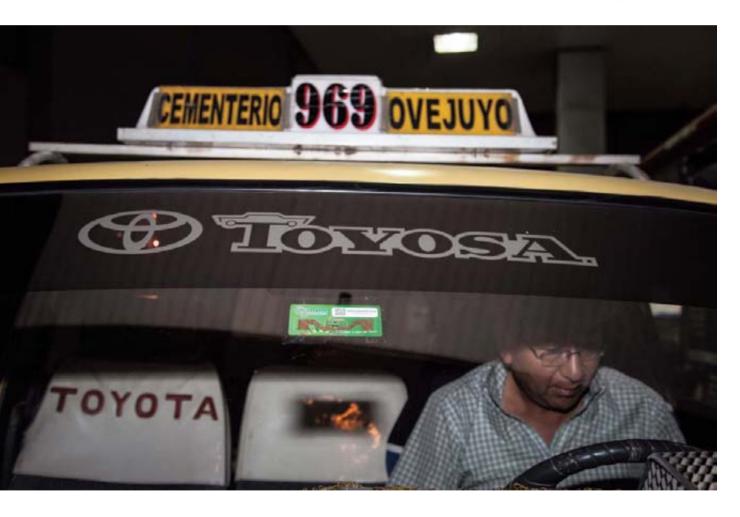
cantly curtail what is realised to be the most common crime in Santa Cruz.

Another use of B-SISA is in the improvement of public bus services. In a joint effort with the the capital's transit authority, RFID antennas are being deployed at bus terminals to track buses that have

Peru, for instance, would track fuel sales in its Madre de Dios region in order to investigate fuel-intensive mining operations that pollute the fragile Amazonian ecosystem.

Back in San Pedro, though, Diego is not exactly sure what the point of the system is. I guess the government is trying to control petrol consumption in order to prevent contraband,' he says, 'but I can't tell you for certain.'

Diego believes that regulating the consumption of state-subsidised fuels is fundamentally a good idea, but appears skeptical when asked about the government collecting drivers' information. 'I am sure the information could be useful,' he says, 'but for all I know it could be used for absolutely nothing.'



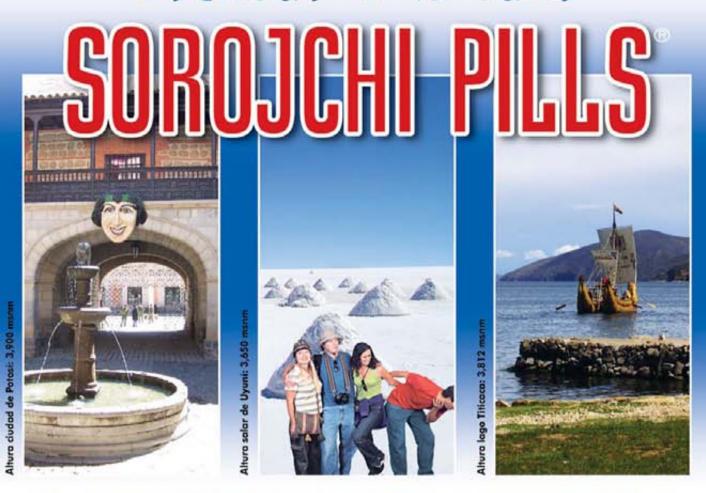
partment (DIPROVE) is one such governmental agency that uses this information. In the simplest case, the agency is alerted if a car that has been flagged as stolen tries to purchase fuel at a gas station. Missing RFID tags or tags which do not match the exact model of the vehicle are also investigated.

RFID tags affixed to them. With this new evaluation tool, passengers can expect more timely service. 'This is not yet working,' asserts Joffre, 'but it will.'

Seeing its success in Bolivia, now other countries are interested in using the RFID tags to thwart illegal mining and logging.

The ANH's most expensive project is undoubtedly one Joffre feels immensely proud of. It has inspired other countries and gained global coverage. However, back home, it appears drivers have been kept in the dark. Perhaps, the ANH should be more vocal about the system if it wants drivers like Diego to share its enthusiasm. *

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