



Testing the Waters

Digital Payments for Water and Sanitation

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EXECUTIVE SUMMARY

When Dickson Marira of Wonderkid Ltd. visited the home of a water utility customer in West Africa, he saw a pile of unpaid water bills held down by the corresponding amount of cash. That family was willing and able to pay their bills, but they had no idea how or where to do so. It became immediately clear to Marira why the water utility was collecting only 6 percent of what it billed its customers every month: it was not communicating with its customers, and it was not offering them a convenient, secure channel to pay what they owed.

While this may be an extreme example, water and sanitation providers in emerging markets often struggle to recoup their costs and become financially sustainable. As a result, many low-income customers are at risk of losing access to safe water and sanitation at a time when countries worldwide have committed to universal access by 2030, under the Sustainable Development Goals. Costly inefficiencies in providers' predominantly cash-based collection systems—of the kind witnessed by Marira—are a major contributor to their high operating costs. Cutting these costs is especially important because governments restrict utilities' ability to increase prices to offset inefficiencies.

A growing number of water providers are experimenting with digital payments to reduce operational expenses and streamline service delivery. To better understand and document their experiences for other water providers in emerging markets who may be considering digital payments, CGAP and GSMA conducted a literature review and interviewed 25 organizations across Africa, Asia, and Latin America. These organizations were a mix of urban utilities, small water enterprises, container toilet companies, and suppliers of hardware and software to the water and sanitation sector. Two-thirds were accepting digital payments or helping their clients to do so, motivated by four goals: cost savings, greater transparency, better security, and business model innovations.

BENEFITS OF DIGITIZING PAYMENTS

- **Digital payments reduce collection costs.** Before digitization, the cost of cash collection ranged from 3 to 20 percent of revenue collected. Digital payments reduced collection costs by 57–95 percent, with most of the savings stemming from reduced staff time and vendor commissions. In Haiti, ecological sanitation provider SOIL decreased collection costs from \$1.10 to \$0.05 by switching to mobile payments.
- **Digital payments increase revenue and enable new business models.** Revenues increased from 15 to 37 percent for providers who reported data, driven by improved billing, increased efficiency, and a shift to prepaid models enabled by digital payments. Safe Water Network in Ghana went from a 30 percent net loss to 1 percent net surplus by introducing digital payments tied to prepaid service.
- **Digital payments also increase customer reach.** Providers used cost savings and revenue growth to expand their businesses or lower the cost of their service. Container toilet company Loowatt did the latter in Madagascar, offering a 15 percent discount for customers that pay with mobile money.

Digitizing payments also have benefits beyond financial considerations: they create data trails that enable providers to offer a higher level of service and improve customers' willingness to pay. They also facilitate the digitization of other business functions like billing, meter-reading, and customer service, all of which contribute to greater efficiency.

OBSTACLES TO DIGITIZING PAYMENTS

Respondents also reported the following obstacles to adopting digital payments:

- **Difficulty integrating mobile money providers.** Some providers reported integrations taking months or even a year longer than expected. A growing number of mobile money operators are offering open APIs to streamline this process.
- **Too few mobile money users.** Nascent digital payment ecosystems may lack the cash-in/cash-out (CICO) service points, robust use cases, and user-friendly interfaces needed to attract sufficient numbers of digital payments users.
- **Fees can deter customers.** If regressively structured (e.g., flat fees on payments within a certain amount), mobile money transaction fees can make

small-value payments prohibitively expensive compared to cash, a deterrent to customers.

- **Limited ability to analyze data.** Providers often have difficulty obtaining accurate data on operations or revenue or may lack the analytical capacity to get the most out of the data.
- **Loss of jobs.** Unfortunately, achieving cost savings in the water and sanitation sector often means eliminating staff positions. Reallocating staff to more efficient roles will make digitization more effective.

Digitizing payments will not solve all the challenges facing water providers as they struggle to become sustainable. However, digitizing payments does deliver clear benefits when it is based on careful analysis and strategic decision making. Water providers in emerging markets should give serious consideration to going digital.



INTRODUCTION

Despite a global commitment to achieving universal access to water and sanitation by 2030, we are on pace to fail (UN 2018). Today, 2.1 billion people do not have access to a safely managed source of drinking water, and three out of every five people do not have access to safe sanitation facilities (WHO and UNICEF 2017). A key barrier to universal access is that water supply and sanitation (WSS) providers often lose money serving their current customers because tariffs are too low, nonrevenue water levels are high, and collection rates are poor. Before they can expand their services to poorer households, WSS providers need to adopt service models that allow them to cover operational expenses while reaching low-income customers.

Digitizing payments in WSS can help to bring financial sustainability to these providers. It has the potential to reduce the cost of collections by eliminating cash handling, minimizing rent-seeking, and reducing fraud, while also increasing revenue through new, more efficient business models. CGAP and GSMA reached out to a subset of WSS providers to learn from their experiences in adopting digital payments. In this paper, we share practical experiences of adapting digital payments to WSS, highlight common challenges to digitization and successful approaches for overcoming them, and offer recommendations for WSS providers that want to digitize revenue collection.

Our research found that digitizing payments in the water sector can have a positive impact on the financial sustainability of water service delivery models for low-income populations. Specifically, digital payments reduce operational expenses and enable more efficient service delivery. These general findings may come as little surprise to those familiar with the literature on digital finance.¹ But WSS has unique characteristics, including significant levels of nonpayment and serious impediments to raising prices, that make digital payments and digital payment-enabled innovations such as pay-as-you-go (PAY-Go) water especially important to the sector.

Major barriers to integration and adoption have impeded large-scale implementation. Realizing the potential impact of digital payments and ensuing customer data will require a greater emphasis on customer service and financial sustainability from WSS providers.

THE STATE OF GLOBAL ACCESS TO WATER AND SANITATION

Sustainable Development Goal No. 6 calls for universal access to safely managed water and sanitation by 2030 (see Box 1). A baseline projection by the World Bank estimated that this would require an investment equivalent to 0.39 percent of global GDP—roughly

BOX 1

DEFINING SUCCESS IN THE WSS SECTOR

“Safely managed water” is water that comes from an improved source (e.g., piped water, standposts, borewells, protected dug wells, packaged, or delivered water), is available when needed, on premises, and is free of contamination (WHO and UNICEF 2017).

An estimated 844 million people lack even a basic improved source of water that is within a 30-minute walk and free of contamination.

More than 2 billion people use a drinking water source that has been faecally contaminated, and contaminated drinking water is estimated to cause half a million deaths every year (WHO 2018).

“Safely managed sanitation” is an improved sanitation facility that is not shared and where excreta are disposed of on site or transported or treated off-site. Sixty-one percent of the world’s population lacks safely managed sanitation. (WHO and UNICEF 2017).

1. See Klapper and Singer (2014).

three times the 0.12 percent that was spent annually from 2000 to 2015 (Hutton and Verghese 2016). These projections assume access will occur through a variety of channels, including those that are individually owned and managed. But a heavy burden will fall on service providers (particularly on the water side) who would need to shoulder a level of investment that is difficult to reconcile with their historically low efficiency.

In part because water is both a human right and a commodity, providers are often prohibited from charging cost-reflective tariffs. Instead, they rely on public subsidies that are often insufficient. Danilenko et al. (2014) reported that the median utility in developing/emerging economies was barely covering its operating costs and had “no capacity to replace its assets once they wear out, let alone expand services to larger groups of consumers.”

Suboptimal finances have led to suboptimal service. The World Bank estimates that 16 billion cubic meters of water are lost to leaks every year, and 10 billion cubic meters are delivered to customers but never paid for, for a total economic loss of \$5.8 billion. While eliminating this loss is not realistic, just halving it would free up enough water for 90 million people annually (Kingdom et al. 2006).

Rural and peri-urban providers are often worse off than urban providers because informal or community-operated systems can be more expensive and/or less sustainable, particularly if public sector commitments and revenue collection are insufficient to cover inevitable capital maintenance. As the water sector works to build a strategy that can lead to sustainable universal access, new tools such as digital payments can be deployed to lower costs and improve revenue collection.

DEFINING DIGITAL FINANCE

Digital finance is a term that encompasses two concepts: (i) financial services—payments, savings, credit, insurance—that are offered using digital channels and (ii) the digital technologies that deliver those financial services to the end user. In this framing, mobile telephony is a digital channel, mobile money is a digital finance technology, and the payment, credit, and savings services accessed over mobile money are digital financial services.

This classification is particularly relevant because most of the digital payments discussed in this paper are sent using “mobile money,” which is a technical term that describes the use of a mobile phone to access financial services. Mobile money transfers or payments are made using an electronic money account or wallet. In many cases involving rural or low-income customers, this requires users to deposit cash with an agent, who

credits their mobile wallet. The agent can then initiate a transfer to a person or organization. Sometimes this money stays in electronic circulation, and sometimes it is cashed out or transferred to a bank account. Mobile money operators (MMOs) are typically mobile network operators (MNOs), banks, or specialized third-party firms. Their services are particularly important for people who do not have formal bank accounts, many of whom are low-income customers who struggle to access safe water and sanitation.²

SURVEYING THE LITERATURE ON DIGITAL FINANCE FOR WATER AND SANITATION

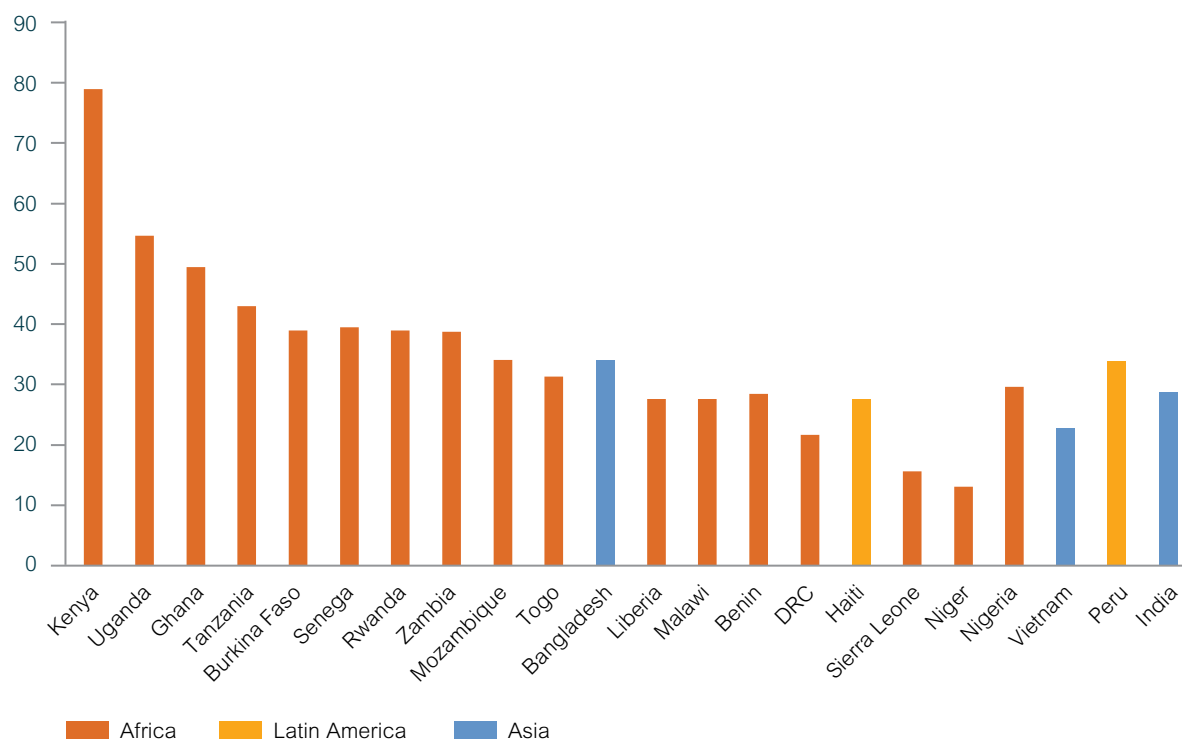
In the early days of mobile money, advocates speculated that digital finance could revolutionize the way people accessed not only payments, savings, and credit, but also material services such as energy and water (Ehrbeck 2014). The assumption was that a convenient, remote payment channel would remove the inconvenience of cash for customers in rural or informal areas, and that a secure channel for collecting revenue would make those customers less of an operational risk for providers. In many countries, the first organizations to accept digital bill payments were energy and water utilities, who were quick to see the potential cost savings.

In 2011, a group of Oxford researchers assessed the use of mobile payments for WSS in four East African countries (Kenya, Uganda, Zambia, and Tanzania). They found that the benefits of digitizing payments were distributed between MNOs, utilities, and users, based largely on the size of transaction costs and who paid them (providers, customers, or both). In-depth research in Kiamumbi, Kenya, revealed that customers who were paying via mobile money were saving time, but that they might not be saving money (Hope et al. 2011). User uptake of mobile payments was limited by “delayed reconciliation of billing systems, limited customer awareness, lack of physical proof of payment, high transaction tariffs, and convenience of alternative pay points.”

The same researchers found that no large-scale utilities were collecting more than 10 percent of their revenue over digital channels, but that if barriers to uptake were overcome, then digitizing payments could lead to “timelier bill payments, higher collection efficiencies and lower administrative costs” (Hope et al. 2011).

Supporting this hypothesis, Ndaw (2015) described the implementation of an “E-Water” billing system by the National Water and Sewage Corporation (NWSC) of Uganda that allowed it to close its banking halls and outsource collections to mobile money and partner banks. This reduced NWSC’s collection costs by as much as 75 percent and increased revenue by 15 percent. Similarly, in 2018 an analysis of container-based

2. This paper looks solely at the impact of digital payments in the WSS sector. For on the potential for digital credit and savings to expand WSS access, see Waldron and Shabbir (2017) and Nique and Opala (2014).

FIGURE 1. Share of adults who made or received a digital payment in the last 12 months (2017 Findex)

sanitation models³ showed that mobile payments could increase a provider's gross margin by 26 percentage points (EY and WSUP 2018). And research by Krolkowski (2014) in Dar es Salaam showed that mobile water payments reduced the incidence of petty corruption and rent-seeking. Yet, overall, there have been few studies on the impact of digital payments on water and sanitation access compared to that of other sectors such as energy or agriculture.

DIGITAL PAYMENTS FOR WATER AND SANITATION IN 2018

Mobile money has existed since at least 2007, and several large-scale providers in East Africa—mobile money began in Kenya—have been accepting mobile bill payments since the beginning of the decade. Figure 1 shows the percentage of the population in each country that had made or received a payment using mobile money, debit/credit cards, internet, and digital finance applications. African countries show levels of digital payment adoption that are higher than countries with equal or greater incomes. Adults in Tanzania are twice as likely to have made/received a digital payment than those in Vietnam, despite the latter having a per capita gross national income twice

that of the former. This is necessity-mandated innovation: lower-density populations and shallower financial systems in Africa spurred experimentation with mobile money, which met a latent demand for remote transfers.

Following the literature review, researchers from CGAP and GSMA spoke with representatives of 25 organizations with operations in 26 countries in Africa, Asia, and Latin America to learn more about the state of digital payments in the water sectors of emerging economies. The research was qualitative and relied heavily on in-depth conversations with leading WSS providers, hardware manufacturers, software companies, and donors, all working daily to improve access to WSS. (See the Appendix for more on methodology and a list of participants.)

Two thirds of the customer-facing providers (including all the urban utilities) that we spoke to were accepting digital payments. The breakdown was largely geographic: all the African providers accepted mobile money, even at relatively low levels. Only one of the Asian providers did so, with several respondents citing constraints such as prohibitive fees and extremely low penetration of payments platforms in rural areas.

One provider in India ran a full promotional campaign to encourage users to start paying with Bharat Interface for Money on their USSD phones.^{4,5} The cam-

3. In container-based sanitation models, human waste is collected in a sealable, removable container that is regularly swapped out by an operator, with full canisters transported to a nearby facility for safe treatment and disposal.

4. Bharat Interface for Money is an application developed by the National Payments Corporation of India. It allows users to make payments from their linked bank accounts using either smart phones or USSD phones.

5. Unstructured Supplementary Service Data (USSD) is a communications protocol used by basic and feature mobile phones to communicate with the network operator's computer systems.

paign was ultimately unsuccessful and found that users had no money in their linked bank accounts and no desire to cash in for this specific purpose.

For the 10 WSS providers in our study who are accepting digital payments, revenue paid over those channels ranged from close to 0 percent to 95 percent, with the latter representing a significant outlier of Clean Team, a container-based toilet business with

2,000 clients in Kumasi, Ghana. The next highest was Nairobi City Water and Sewage Company (NCWSC), which reported that 38 percent of its revenue was received over M-PESA. This had taken almost a decade to achieve, and significant growth happened only after real-time billing and integrated complaint solutions were introduced.



COST AND REVENUE BENEFITS FROM DIGITAL PAYMENTS

CASH REPRESENTS A SIGNIFICANT COST FOR WSS PROVIDERS

This observation is perhaps obvious, but important: cash is expensive. It requires paid or commissioned staff to collect, trucks to transport, and bookkeepers to manually reconcile.

- Ghana Water Company Limited (GWCL), the provider of all municipal water in Ghana, estimated that its total cash collection costs are 3.3 percent of revenue (including staff, transport, printers, and all other associated costs).
- Small water enterprises such as Water4 are currently paying vendors commissions of 20 percent or more of revenue collected. Vendors are generally tasked with monitoring communal taps and collecting payments; their jobs are directly linked to the acceptance of physical cash.
- Container toilet provider Loowatt reports that collection costs make up 15 percent of its pricing model.
- Before closing most of its payment halls and shifting to a digital billing/collection model, NCWSC incurred large cash management costs. Just postage for paper bills used to cost the utility approximately \$600,000 annually.

DIGITIZING PAYMENTS DECREASES OPERATIONAL COSTS

Every provider in the study that had digitized payments reported being motivated wholly or in part by saving on the cost of cash. Lori Gonnu, from 1,001 Fontaines, explained the dilemma that providers face, which makes cost-saving measures such as digitization so important: “Providers are not going to increase the prices, so the only way to be sustainable is to sell more or reduce costs.” Digital payments offer the opportunity to do both, and savings are the immediate benefit.

On this front, as expected, 16 out of 24 respondents (67 percent, excluding the one donor) reported that they spent less on collections when customers paid with mobile money instead of cash. Another 13 percent reported that they were digitizing collections in the *hope* of reducing costs.

- Ecological sanitation provider SOIL installs toilets in homes in Port-au-Prince, Haiti, for a monthly fee.

Door-to-door collections had a 35–40 percent success rate and required valuable staff time. Shifting all collections to mobile money or in-office resulted in immediate savings: SOIL estimated that each cash payment collection costs \$1.10 versus \$0.05 for each mobile payment. And on-time payment rates for mobile money payers are 12 percent higher than for cash payers.

- Drinkwell, which installs and manages water ATMs in India and Bangladesh reported the cost of collections at 20 percent of revenue when collecting cash at the point of sale. When it switched to pre-paid cards that users could top up at nearby shops (a semi-digital payment, discussed below), cost of collections dropped to 2 percent of revenue.
- Clean Team, a container-based toilet enterprise in Ghana, estimates a shift from about 25 percent mobile payments to about 95 percent resulted in a 2-percentage point increase in its gross margin.
- After the Kisumu Water and Sanitation Company worked with Wonderkid to introduce mobile services for billing, collections, and customer care, it saw a 28 percent increase in revenue collected on an 8 percent increase in revenue billed. Mobile payment volumes increased by 71 percent.⁶
- In a pilot of prepaid household meters linked to digital payments, Safe Water Network in Ghana saw a 37 percent increase in realized revenue (see Box 2 for more details).

With tight (or negative) profit margins in the WSS sector, collections expenses offer a rare opportunity to reduce costs *while* improving service, by making it more convenient for customers to pay. However, the largest driver of cost savings is usually reduced staff salaries or vendor costs. Achieving these cost savings may require reallocating staff or making difficult decisions to reduce workforces.

“Providers are not going to increase the prices, so the only way to be sustainable is to sell more or reduce costs.”

—LORI GONNU, 1,001 FONTAINES

6. See GSMA (2017) for more detail.

BOX 2

MARGINAL COST STRUCTURE OF A WATER SERVICE PROVIDER

Safe Water Network is a nongovernment organization that establishes small water enterprises in peri-urban and rural areas throughout India and Ghana. In Ghana, its systems are built using donor/government funds, and they are operated by Safe Water. The organization's financial goal is to cover all operating expenses and capital maintenance expenses and to eventually generate a small profit (of which a portion goes to the local community) through user tariffs. While customers are willing to pay for quality water, there is a strong incentive to keep water affordable, which motivates Safe Water to drive down costs.

The following breaks down Safe Water Network's unit economics for one cubic meter (m^3) of water. Its tariff (and expected revenue) is \$1.16 per m^3 . Beyond the fixed costs of Safe Water Network's purification and distribution infrastructure (\$0.13/ m^3), its main costs are:

- **Provision for under collection (nonrevenue water).** Water that is pumped but not paid for, either due to leaks or under-collection—\$0.31/ m^3 .
- **Capital maintenance expenses.** Depreciation on capital assets such as meters, standpipes, and purification technology—\$0.24/ m^3 in the baseline.
- **Variables costs related to station operation.** Includes operator travel, stationary costs, and fees—\$0.31/ m^3 in the baseline.

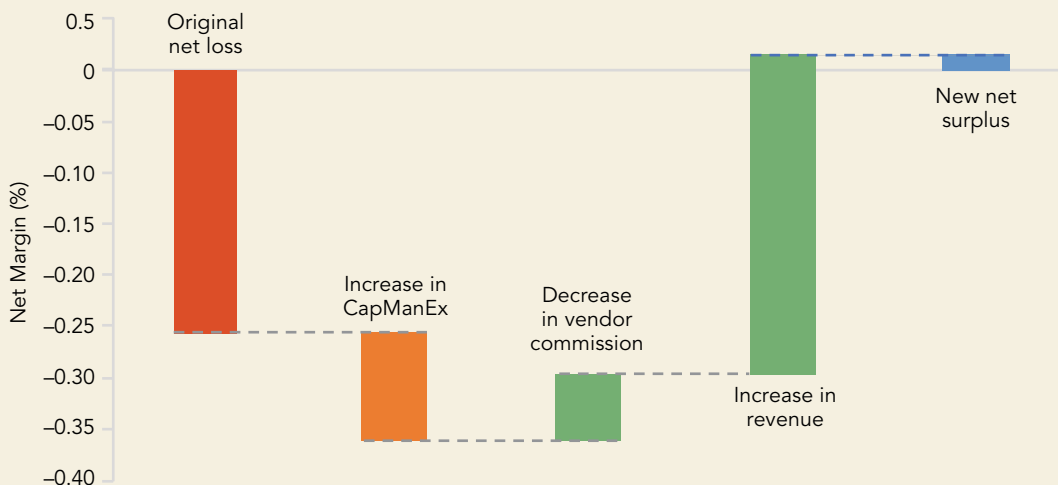
- **Vendor commissions.** Pay to local vendors stationed at every communal tap to collect revenue. Vendors are compensated at 20 percent of all revenue collected—\$0.12/ m^3 .

Combined with direct financial support to the station (\$0.31/ m^3), the baseline scenario has the station losing \$0.26 for every m^3 provided.

Figure B2-1 shows how digital payments, together with prepaid service, change the financial viability of Safe Water's service. Adding prepaid hardware and mobile systems increases its capital replacement costs by 10 cents, bringing the deficit to \$0.36/ m^3 . Prepaid systems also eliminate under-collection (a 31-cent savings) by requiring users to pay before they consume water, instead of chasing them for payment after. And automated systems that rely on digital payments cost far less per transaction than the 20 percent of revenue that vendors were receiving (net savings of 7 cents). Safe Water's gross margin more than doubled, and it is now breaking even or generating a small net profit.

Just by digitizing revenue, the net margin increases by \$0.07 (16.5 percent)—important, but not transformative. Other savings on cash management are canceled out on transaction fees, which Safe Water Network pays on behalf of its customers. The combination of prepaid water and digital payments makes the operation financially viable.

FIGURE B2-1. Change in net surplus/loss due to digital payments (Hwang 2018)



OTHER ADVANTAGES OF GOING DIGITAL

Digital payments deliver clear cost benefits, but there are other ways that digitizing transactions can improve the overall business model for WSS, making it more sustainable. Instant payments that leave permanent data trails allow providers to offer a higher level of service, which in turn can improve customers' willingness to pay.

AUTOMATIC PAYMENT RECONCILIATION

When a cash payment is received by a provider, it can take days or weeks to be entered into its accounting system. A lot can happen in that time. According to Wonderkid, it is not uncommon for utility customers to pay a bill (in cash) in the morning, then be disconnected the same afternoon because of slow reconciliation. Longer reconciliation cycles also mean that the business must wait before it can reinvest that revenue.

With digital payments, cycles are shorter. When customers with prepaid smart meters make a digital payment, a backend system updates their balance immediately to generate a token code. But to realize the full value of digital payments, more complex software integration is needed with the payment processor (who must also invest in its backend processing), so that the WSS provider is notified about payment in real time, and the payment is credited to the proper user's account in its billing system. Without this, manual account reconciliation done at the end of the day can still lead to unintentional cut-offs. The GSMA Instant Payment Notification Hub, which helps address this challenge through a platform that eases integrations, is covered later in this paper.

TRANSACTION RECORDS FROM DIGITAL PAYMENTS CREATE TRANSPARENCY

If cash changes hands and nobody records the transaction, does a business make money? Often, the answer is no. Digital payments create automatic, indelible records of a financial transaction, and those records create much-needed transparency. Several business-to-business (B2B) companies told us stories of providers uncovering significant levels of fraud, at all levels in the organization, during the process of dig-

itization. One small water enterprise reported that its nonrevenue water had reached 22 percent, which it believed to be almost entirely nontechnical losses (i.e., under-billing or theft by vendors).⁷ Asking meter readers and sanitation agents to handle large amounts of cash distracts from them from doing their core tasks and poses a significant security risk and an unnecessary temptation.

Transparency is important for both providers and customers. Water tariffs are established through long processes, then posted. When customers use public water or sanitation, they need to know that they are paying the posted price for that service. This benefit is best illustrated through its counter example: one East African utility showed us a group of privately operated kiosks, where operators were contracted to buy water from the utility and to sell it at a 40 percent mark-up. However, at the kiosks we visited, operators were selling water at a mark-up that was anywhere from 185 percent to 700 percent, seeking payments that far exceeded what was specified in their contracts. The utility was in the process of moving to 100 percent digital payments and automated dispensing, which would cut out rent-seeking from vendors and give customers confidence that they are paying the established price for water.

MODELS LIKE PAYGO REQUIRE DIGITAL PAYMENTS

PAYGo solutions link payment and usage seamlessly. In the water context, customers use their mobile phone to send a payment, which is tagged with their unique account number. This payment is recognized by the backend system which triggers an automatic signal to the water meter or sends an SMS code that users input via keypad, either of which unlocks water service for the purchased volume (or time). This can happen from anywhere at any time, and the marginal cost to the provider of collecting each payment is effectively zero (although providers may pay to license software).

Just as digital payments can exist within post-paid service frameworks, prepaid meters/kiosks can function with a network of cash-in points (see Box 3 for more on the differences between prepaid and PAYGo). But several respondents (notably CityTaps,

7. Nonrevenue water is water that is pumped but never paid for because of technical (leakage) or nontechnical (theft or non-payment) issues.

BOX 3**PREPAID VS. PAYGO SERVICE**

With prepaid service, payment is received *before* a service or product is delivered. The terms *pay-as-you-go* (PAYGo) and *prepaid* are often used interchangeably, but they are not technically the same. Customers who pay cash to a vendor to fill their bucket are prepaying for their water.

PAYGo in this paper refers to water or sanitation service that is *automatically* triggered or enabled by a digital payment. In other words, all PAYGo services are prepaid, but not all prepaid services are PAYGo.

SEEN, and Safe Water Network) believed that the two solutions (digital payments and prepaid meters/kiosks) are more powerful if they are deployed together. Installing prepaid meters without digital collections requires establishing systems for receiving and managing cash (which may be some distance from a customer's house and not available at all hours), as well as a system for vending credit tokens to top-up meters. Both are expensive to maintain because of commissions paid to middlemen. Similarly, there are fewer benefits to digital payments if a staff member still must visit every customer every month to read their meter.

The landscape of PAYGo solutions for the water sector is both limited and expensive, and significant innovation will be needed to scale these products and services. The sector will need to work closely with digital payment systems to gain wider adoption. Grégoire Landel, the CEO and co-founder of CityTaps, a smart meter company, was succinct when describing the linkage: "There is no [CityTaps] meter without mobile money."

BENEFITS OF DIGITIZING NON-PAYMENT FUNCTIONS

WSS providers need lots of capital to expand access, even if they are not strictly for-profit entities, and so digitizing revenue collection is often their top priority. While this approach is understandable, several providers noted the importance of digitizing other processes besides payments. PAYGo water is a good example of this: the entire payment/use experience happens seamlessly and digitally. But prepaid is by no means the only service model, and there are other processes that could benefit from digitization.

Meter-reading

Remotely monitoring postpaid consumption, through machine-to-machine communication or applications

that allow a user to read their own meter on the utility's behalf, makes the billing cycle more flexible and lowers the cost of meter-reading, which is often hampered by low response rates. In Nairobi's informal Kayole Soweto neighborhood, water connections were perceived as nonviable, partially because meter readers did not feel safe visiting households. A digital, self-reading mobile solution called Jisomee Mita eliminated the need for physical reading and made water connections possible (Ndaw and Mangi 2015).

Billing

GWCL emphasized the importance of digital billing for customers. Digital invoices allowed customers to see the volume they had consumed and the rate at which they were being charged. They could then make a payment on that bill and feel comfortable that they were paying the right amount. Or if the amount was wrong, they could act.

Customer feedback and inquiries

Dickson Marira of WonderKid tells a story about going into the homes of one utility's customers. The utility was collecting only 6 percent of what it billed in a given month, and it was immediately apparent why. He met customers who had stacks of bills held down by stacks of cash. These customers were ready and eager to pay their water bills, but they did not know how or where to pay.

While this obviously speaks to a broken collections system, it also indicates something else: a lack of communication between customers and their providers. This is a frequent problem with utilities. When customers experience a breakdown, they do not think of calling their service provider because that has always been an exercise in futility. In places such as Nairobi and Kisumu, WonderKid (with support from the World Bank) helped to solve this with MajiVoice—a digital platform for lodging complaints from different channels, including SMS, USSD, internet, and over the counter. Once utilities enable easy communication, they can address customer issues. Wonderkid sees a digital complaint channel as the crucial first step for its client utilities. A digital complaint channel has a positive impact on consumer confidence, which can translate to uptake of revenue-generating or cost-saving digital services.

"There is no [CityTaps] meter without mobile money."

—GRÉGOIRE LANDEL, CITYTAPS

DIGITIZING INTERNAL TRANSACTIONS

Digitization is a process that happens over time. Because setting up a user-facing system for digital payments is a long process, many manufacturers and servicers of communal water points have opted to take a quicker route.

Instead of users sending a remote payment directly to the operator, they can use a water ATM, which often accepts payments from prepaid smart cards or tokens (see Figure 2). These prepaid instruments require users to top-up their account through an agent or vendor who loads credit using an application or point-of-sale device. When users tap their card against a reader in the water ATM, the reader pings the system (or a recent backup if it is offline), verifies that the requested amount will not exceed the user's balance, and debits that account. This requires less integration with the MNO and, therefore, is easier for most providers to implement.

There are many upsides to using this system as opposed to using cash:

- Users generally are able to access water 24 hours a day, if they hold a balance.
- The system does not allow arrears to accumulate and does not require regular supervision from a water point operator (most providers we spoke with have contracts with local entrepreneurs to serve as token agents).
- Cash risk, although not eliminated, is transferred from the organization to the token vendor.
- The system provides transparency for both provider (revenue) and user (price), and it creates detailed records of individual consumption.

The downside compared to a fully digitized system that allows users to load credit independently includes the following:

- The vendor still receives some commission (10 percent of revenue for Sarvajal) for performing top-ups, so costs remain.
- Users can top-up their balances only when the vendor is available, which may decrease sales and inconvenience users if they need water at night.
- There is an added expense of purchasing physical prepaid instruments, such as cards.

All in all, cash plus card is a significant improvement on cash. It can exist in parallel with a fully digital top-up option, and it serves as a useful bridge to fully digital collections, particularly in places where users are unaccustomed to initiating payments.



FIGURE 2: A Woman using a water ATM in rural Gambia (Courtesy of eWaterPay)

DATA FROM DIGITAL TRANSACTIONS

Surprisingly, no providers reported using data from customer payments to influence business decisions or allocate resources, although many were planning to do so. Hardware and software providers also say that their clients are not using data to the fullest extent possible. In some cases, systems were incompatible in their data structures, but this could be fixed in future iterations. In other cases, software and hardware providers sought to protect their data, which they considered to be valuable, thus limiting the scope of analysis for their partners and customers.

To increase the value clients receive from their hardware or software, B2B firms like Wonderkid or CityTaps create monthly data analytics reports on the service for their clients. This supports decision-making and helps to build WSS providers' analytical capacity. More B2B providers can offer this service or enable their customers to analyze their own data. And as a lack of analytical capacity is also a key barrier to digitization, investing in analysts and analytical tools should be an essential part of any provider's digital payment strategy.

BOX 4**MOBILE MONEY USE IN PAYGO WATER: SAFARICOM-GRUNDFOS KIOSKS IN KENYA**

Grundfos (a Danish water pump manufacturer) and its partners World Vision (an international charity), mobile operator Safaricom, and local communities have installed 32 self-service water kiosks for homes and businesses in Kenya that lack water infrastructure. The kiosks (called LifeLink) are automated water distribution points that are integrated with a mobile money payment facility (through Safaricom in Kenya) and real-time GSM monitoring of water dispensed and payments made.

The GSMA Mobile for Development Utilities team contracted researchers to conduct individual and group interviews at 10 of these sites in Kenya to understand the level of mobile money awareness and use of PAYGo water payments among users of the water ATMs. The research included questions around

frequency, mode (cash/mobile money), payment experience, and limitations of using mobile money.

In six out of seven Grundfos locations surveyed, mobile money was the only mode of payment for water. Even in Kenya, where M-PESA is omnipresent and 73 percent of adults have a mobile money account, WSS providers are driving increased use. Thirty-five percent of interviewed customers made their first mobile bill payment at LifeLink ATMs; users who had previously used only mobile money for remittances or airtime top-ups are now paying for other services, such as school fees, on their phones. Much of this was driven by value: Lifelink water is cleaner and cheaper than water sold by private sellers, and customers are now tracking and optimizing their water spend in ways they could not before digitization.



FIGURE B4-1: A Grundfos Lifelink kiosk in rural Kenya (Courtesy of Grundfos)

IMPLEMENTING DIGITAL PAYMENTS

For users to adopt a digital payment solution, certain basic elements must be in place. WSS providers can take the following steps to build the foundation for a digital payment solution. These recommendations are based on experiences with mobile money, but they are broadly applicable to other digital payment platforms:

- Understand the costs of cash collections and how they impact the unit economics for WSS. Without this basic knowledge, it is not possible to determine if there is a business case for digitizing payments.
- Conduct research within a service area to determine which, if any, payment operators have an established cash-in/cash-out (CICO) infrastructure. These CICO points (usually mobile money agents) are essential—without them, users who currently make most transactions in cash will be unable to load electronic money to their wallets.
- Meet with customers to understand what payment technologies they are familiar with, what their personal experiences have been, the potential costs and benefits for them of switching to digital payments, and any requirements they would have around a new payment/service model.
- Negotiate commercial agreement(s) with the payment systems operator(s). This is discussed in detail in the next section.
- Receive a dedicated paybill account to which users can direct mobile payments.
- If necessary (e.g., if providing PAYGo services or collecting a high volume of daily/weekly payments), integrate the WSS billing system into the payments platform so that the billing system receives instant notification of payments and automatically credits user accounts.
- Develop tailored marketing and training materials that help users to understand the benefits of mobile payments and empower them to initiate transactions.
- Implement, experiment, and iterate.

“Some of the challenges in implementing digital payments is the integration and local nuances with each local payment provider. Each country has a bit of their own standards and APIs. For a company that works in multiple countries like SusteQ, it’s a barrier.” —MARTEN SUSEBEEK, SUSTEQ

INTEGRATION CHALLENGES WITH MMOS

In the past decade, MMOs have become the providers and gatekeepers of complex payment platforms that go beyond traditional banks. Although users benefit from this, figuring out the right business model for mobile money has been a process of experimentation. There is consensus that, in the long run, open and accessible platforms are more effective at generating value and therefore use. Operators such as MTN and Safaricom have taken the step of publishing their application program interfaces (APIs) and creating a virtual sandbox for application testing, allowing developers to integrate with and innovate around the M-PESA platform.

However, most other MMOs have yet to take this step, which means that integration with a mobile money service or an aggregator is done on a case-by-case basis and is constrained by human and technical resources. In a few cases, mobile money integration was handled quickly, but several WSS providers told stories of waiting months or even years to integrate with MMOs. Manobi, for example, spent more than one year integrating with an operator in Benin.

NEGOTIATING COMMERCIAL AGREEMENTS WITH MMOS

Municipal utilities that serve tens or hundreds of thousands of customers bring clear value to MMOs through the sheer volume of their annual cash flows. This allows them to enter negotiations from a position of relative strength. But smaller and/or rural WSS providers may need to convince MMOs of their value, particularly if they are seeking more complex, systems-level integration.

In theory, WSS providers are ideal partners for MMOs. There is no commodity more essential than water and, if mobile money is connected to its daily procurement, that can be a powerful and sticky introduction to mobile bill payments. But smaller-scale providers still need to offer realistic and defensible projections of the number of customers and volume of transactions that they will reach, and they must meet those targets. Providers in more rural areas can also emphasize that they will bring more active mobile money users to the platform. For example, SOIL reports that 60 percent of its customers are new to mobile money, and 19 percent of them had opened an account but never made a transaction before paying for SOIL (see Box 4 for similar findings in Kenya). Rural providers also help agents to balance liquidity by providing a cash-in use case.⁸

Karim and Komu (2017) highlight six important considerations for commercial partnerships between utility providers and MMOs:

- Both parties protect customers' privacy by keeping customer data secure.⁹
- Resolution procedures are applied to resolve issues between customers and either provider or between the providers themselves.
- The size of transaction charges and who pays them are established: Are they paid by the customer, or the service provider, or shared by both?
- Minimum amount and frequency of settlement is established, as well as the party that initiates settlements, or if they will be conducted automatically.
- Service-level agreements clearly define each party's roles and responsibilities (e.g., the MMO commits to sharing its API and providing timely notification of system changes).
- Tax obligations of both parties are noted.

INSTANT PAYMENT NOTIFICATION AND APIS

Real-time, automated data sharing is essential for PAYGo models. Service providers' systems need to be alerted immediately when a customer has made a mobile payment so that the service provider is able to reconcile the payments (matching the payment to a unique ID number) and unlock the PAYGo meter for the corresponding volume or time (either directly or by sending the user a code to

input). Automated, rapid service delivery is the implicit bargain that PAYGo providers make when they ask their customers to prepay: you get what you pay for, on time, and in full.

This functionality requires integrating the systems of a WSS provider and an MMO. In the past, systems-level integrations were done one on one or through a payments aggregator who was integrated with several MMOs. GSMA's Instant Payment Notification (IPN) Hub aims to simplify this process by using a single platform.¹⁰ The IPN Hub enables service providers to receive real-time notification from several MMOs that are connected to the platform. GSMA is scaling up this service across Africa and is working with its mobile operator members to connect them to providers in the WSS and energy sectors.

More complicated service offerings like automatic debit payments from a mobile wallet require more sophisticated APIs. These may not be publicly available and can vary significantly from operator to operator. CGAP and GSMA have been working with mobile operators for years to help them make their APIs accessible and harmonized, which will reduce complexity and enable innovation.

The IPN Hub and open, harmonized APIs can help companies to quickly integrate with mobile payment platforms and develop more specialized tools that improve the user's experience.

THE COST OF TRANSACTIONS

Asking users to switch from cash to a new payment modality becomes even more difficult if they must pay to make a transaction. Yet that is the situation that many service providers are forced into. Respondents reported that mobile money fees for WSS payments varied, in both size and structure. The latter is particularly problematic: block fee structures can disincentivize micropayments because they can add 5 percent or more to payments under \$1. This effectively eliminates the core value proposition of digital payments from the customer's perspective and should be a major concern for any operator looking to digitize collections.

Different MMOs offer different pricing options—these disparities are a major issue to resolve when

"The payment for water is very low, a micro-payment even, and the transaction fee makes it prohibitive."

—JESPER LORENZEN, GRUNDFOS

8. See Bayen et al. (2017).

9. See CGAP, "Data Protection Blog Series," accessed February 14, 2019, <https://www.cgap.org/blog/series/data-privacy-and-protection> and Maina (2018).

10. GSMA, "The Instant Payment Notification (IPN) Hub," accessed on October 15, 2018, <https://www.gsma.com/mobilefordevelopment/mobile-money/instant-payment-notification-ipn-hub/>.

negotiating a commercial agreement. In some cases, WSS providers can pay a bulk fee to the MMO and price it into their tariff (assuming it is less than what they were paying for collections). In other cases, providers pass the cost directly to the consumer. And some MMOs allow the fee to be split between provider and consumer. In any case, WSS providers need to evaluate what the fee structure will mean to the average customer and make sure that customers see value in the long run. If providers can demonstrate increased registrations and use, they may be able to build a case for concessionary rate structures, which will, in turn, accelerate adoption.

Sanitation providers have been passing savings from digitization on to their customers to encourage adoption. In Madagascar, Loowatt has made sanitation cheaper by offering a 15 percent discount for customers who pay using mobile money. SOIL in Haiti and Clean Team in Ghana have rolled out similar initiatives, offering 8 percent and 12 percent discounts, respectively.

ECOSYSTEMS FOR DIGITAL PAYMENTS

Payment platforms are multisided: to function optimally they require many different types of users on both sides. Without customers who are willing to pay for goods digitally, why should merchants bother accepting digital payments? And without a wide variety of added-value use cases, why should customers bother to adopt the technology in the first place?

In many markets, users of mobile money simply do not have enough places to use it. Loowatt customers in Madagascar can use mobile money to pay their electric bill or cable TV subscription, but few of those customers have electricity, let alone TVs. In the future, other companies that accept digital payments stand to gain from Loowatt's work with its client base. MMOs are already benefitting from the volume that water/sanitation providers drive onto their platforms. But for WSS providers who need to educate their clients on how to make a digital payment, much work remains.

THE DISTRIBUTION ECOSYSTEM

In the future, poor rural water customers may keep a balance on their digital wallet, stop carrying cash, and make everyday purchases with mobile phones or contactless cards. But that scenario is still some ways away. For now, it is safe to assume that most digital payments will require physical money to be converted to electronic money (and vice versa, for individuals receiving payments). To do that, customers need CICO points, which are usually mobile money agents.

Agents are the backbone of any mobile money deployment. Their proximity and reliability are crucial factors in digitizing payments. In Sub-Saharan Africa, cities and towns typically have no shortage of agents, but smaller villages may have only few agents, or none at all. In addition, agents in rural areas often face difficulties in balancing their cash and electronic liquidity.

WSS providers, particularly those that serve rural segments, can bring substantial value to MMOs. Rural agents are traditionally used as cash-out points for villagers who receive domestic or international remittances. But small water enterprises or sanitation providers can offer a use case for cashing-in or leaving money in the wallet. MMOs that are eager for more use cases may be willing to help WSS providers by establishing agents in key locations and incentivizing those agents to drive mobile bill payments. Alternatively, WSS providers may decide to register their own staff or vendors as mobile money agents. Early evidence shows that this approach can ease payment restrictions for service providers while opening up new markets for MMOs (Winiacki and Pillai 2018), but this would require a separate business analysis and agreement with an MMO.

In non-African contexts, the rapid proliferation of digital payment options makes this an interesting time to pursue integration. Different WSS providers reported both a lack of or too many digital payment options. In Bangladesh, Drinkwell had to choose between Bkash, Rocket, and traditional bank agents, with penetration and cost being its main considerations.



FIGURE 3: A flyer promoting mobile payment for water in Ghana (Courtesy of Safe Water Network)

DIGITAL ILLITERACY MEETS BAD CUSTOMER INTERFACE

Digital payment systems run the gamut from mobile money to credit cards to messenger applications. Some of these offer intuitive, user-friendly experiences. However, many mobile money services—particularly in Africa where smartphone penetration continues to lag—still run on Unstructured Supplementary Service Data (USSD) protocol. USSD is essentially a language comprised of numbers, dashes, and asterisks that is used to communicate between mobile phones and the MNO's computers (see Figure 3).

That such a rudimentary system can and is used to channel billions of dollars across countries and continents is nothing short of amazing. But that the system is not particularly user friendly is an unfortunate reality. Also, USSD protocol is vulnerable to outside interference, which makes vigilant monitoring and user authentication through PINs crucial for bill payees.¹¹

In most cases, making a mobile payment requires a user to read several menus; enter in a paybill number, account number, and PIN code; and complete the entire process within the allotted time for a USSD session (otherwise, they will be forced to start over). For literate, numerate customers, this can be a challenge. For illiterate, innumerate customers, it is basically impossible without some level of one-on-one instruction. And like it or not, it is often innovative service providers that find themselves taking on the burden of that training (see Box 5).

INCREASED MOBILE MONEY TAXATION

Politicians in Kenya, Uganda, and Zimbabwe have recently levied or increased excise duties and taxes on withdrawals from mobile wallets. This has led many users to shy away from mobile money, whether or not the tax affects bill payments, with PAYGo solar providers in Uganda reporting a 10–15 percent reduction in mobile money transactions per customer (Ferracuti 2018).

BOX 5

EXPERIENCE OF SAFE WATER NETWORK WITH INTRODUCING MOBILE PAYMENTS

In Ghana, 85 percent of Safe Water Network's customers had mobile money, but only 10 percent had ever initiated a payment of any kind. When customers tried to use mobile money, they faced a range of complications:

- Menu was in an unfamiliar language.
- Too many steps and numbers.
- USSD session timed out if they took too long.
- Lack of clarity around payment receipt.
- Lag between payment and receipt of a prepaid token.

Safe Water Network collaborated with the country's leading MMO (MTN Ghana) to conduct workshops for its customers on how to make mobile payments. In the months immediately following the workshop, it saw a 20-percentage point jump in the share of revenue coming through mobile channels (Waldron 2018).

11. For more on information, see Ilia Abramov, "Exploiting SS7 Vulnerabilities in Mobile Networks for Criminal Gain," Info Security, accessed on February 13, 2019, <https://www.infosecurity-magazine.com/opinions/exploiting-ss7-vulnerabilities-in/>.

INTERNAL BARRIERS

THE NEED FOR ACCURATE DATA ON BUSINESS OPERATIONS

The decision to adopt digital payments should be based on a careful analysis of the various costs and benefits to all parties: the MNO, the customer, and especially the water provider. However, we found that many business managers at utilities and small water enterprises do not know the baseline measurements of their business (cost of cash collections, non-revenue water, etc.), making it impossible for them to quantify the return or impact of investing in digital technology. Digital billing has helped NCWSC reach an 85 percent collection rate, but it has no historical data to use as a benchmark. One B2B company described a utility client who had no clear view of its overall monthly revenue.

To some degree, this reflects the analog state of WSS providers—digitizing billing and collections should shine light on the financial situation. But providers need accurate data on the cost of these operations to accurately measure the impact of digitizing them. Collecting and analyzing operational data are fundamental steps, and providers need to take these on before they begin digitizing payments.

RE-ALLOCATING OR REDUCING STAFF MAY BE NECESSARY TO SAVE COSTS

A prominent obstacle to digitizing payments is its impact on staff of water providers. Eliminating meter reading and payment halls saves providers money

and can lead to better service to more people. Although the aggregate impact of digitizing payments is both positive and significant, that impact is diffused over time and across thousands or millions of customers. For staff whose jobs are eliminated as result of this shift, its effect can be negative and immediate.

Providers reported that the effect on staff is a serious downside when considering whether to digitize payments. Managers of small water enterprises talked about having to lay off vendors who had become like family. The story is even more complex for managers of larger utilities who have unionized workforces. In their case, workers whose tasks have been digitized must be given more productive work, and full cost savings from digitization may not be realized for several years.

However, there are ways to reduce the impact on staff. Growing organizations are usually able to reallocate staff and boost their efficiency. And as previous examples have illustrated, there is an abundant need for better customer service that could be fulfilled by former collections staff.

Nevertheless, providers will need to make hard decisions. They must focus on the business case when they compare the benefits to their customers against the disruption to their workforce. Decisions to reduce staff need to be communicated and managed as compassionately and carefully as possible. Policy makers looking to eliminate cash—although they are wise to do so overall—must ensure that policies are in place to compensate and re-train workers whose jobs are lost in the transition.

“The organizations that run small decentralized water treatment and distribution systems, especially in rural areas and remote locations in Africa, are part of the local communities. These small water entrepreneurs don’t have the financial means or organizational structure to evaluate, operate, or control a new digital system.” —RUI BRAS GOMES, CUBO

“If we could move all payments to digital, we would be happy. Staff could work on other tasks, it would reduce transport and security costs, and customers would have added convenience”—
ELDAH ODHIAMBO, KISUMU WATER AND SANITATION COMPANY

CONCLUSION

WSS providers need to increase revenue to achieve universal access, but they are often unwilling or unable to increase tariffs. A focus on reducing costs and increasing efficiency will help providers achieve sustainability. Digitizing payments can lead to operational savings, and adopting other digital technologies (e-billing, meter reading, customer relationship management tools etc.) can magnify these savings. There is reason for optimism in the WSS sector, but the social, institutional, and technological barriers highlighted in this paper must be overcome, or they will limit the potential scale of digital payments and other solutions.

RECOMMENDATIONS

Providers need to be clear about why they want to shift to digital and what results they expect to have. Explicitly defining their desired outcomes of digitization (cost savings, consumer data, business transparency, etc.) and quantifying them wherever possible will help providers to make informed decisions on when and how to invest in digitizing payments.

In many areas that want to expand access to WSS, mobile money is the only digital payment system available, and its reach may be limited to nonrural areas. An enabling mobile ecosystem is needed for digital payments to work in the WSS sector. MNOs, regulators, and others need to work together to deliver network coverage to the last-mile, build a robust mobile money infrastructure with several use cases for low-income populations, and reduce

or eliminate fees for small, routine transactions. In the short term, WSS providers need to be creative in establishing CICO points and integrating their systems with payment platforms. At the same time, payment providers need to actively collaborate with stakeholders in the WSS sector.

Providers need to prioritize overcoming internal barriers to digitization—for example, lack of proper financial data or a poor customer service culture. They need to build a sound financial model that facilitates strategic decision making. The business model should reflect a customer-centric approach; WSS providers need to understand why their consumers choose to pay through other channels and how they should go about addressing customers' desires, concerns, or pain points.

A NOTE OF CAUTION AND OPTIMISM

Digital payments are not a panacea. But with careful analysis and a considered strategy, digitizing payments can help WSS providers lower costs, improve service, and unlock new business models. To reap these benefits, providers must pursue long-term financial sustainability. This means embracing data, analytics, and customer service; eliminating waste and fraud; and creating an organization that is well-governed and financially sustainable. Digital payments are just a technology. They are not a substitute for proper governance and institutional controls.

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ANNEX 1. METHODOLOGY AND LIST OF INTERVIEWEES

RESEARCH METHODOLOGY

GSMA and CGAP partnered to investigate the state of digital payments in the water sectors of emerging economies. The research was qualitative, relying heavily on in-depth conversations with leading WSS providers, hardware manufacturers, software companies, and donors, all working daily to improve access to WSS.

We spoke with 25 organizations with operations in 26 countries in Latin America, Africa, and Asia. Of our sample, 14 firms were directly providing customers with water or sanitation through a variety of business models, including water and sanitation utilities, small

water enterprises, container sanitation firms, and others (customer-facing firms). 12 firms were supplying WSS providers with hardware, software, and/or data analytics (business-facing firms). Two firms straddled the divide, operating as customer service providers in some markets and as hardware/software/consultancy providers in others. And one organization was a foundation that had rich expertise in the WSS sector. Our sample is not exhaustive, and it skews toward markets with established mobile money deployments.

Those conversations with industry leaders form the backbone of this paper, which is both a stock-taking and an introduction to the topic.

NAME	TYPE	REGION	CUSTOMER-FACING WSS PROVIDER?	FACILITATES/ ACCEPTS DIGITAL PAYMENTS FROM END USERS?
1,001 fontaines	Small Water Enterprise	Asia	Yes	Noa
CityTaps	Hardware/Software	Africa, Latin America	No	Yes
Clean Team	Container Sanitation	Africa	Yes	Yes
Cubo Rei	Hardware	Global	No	Yes
Drinkwell	Small Water Enterprise	Asia	Yes	No
eWaterPay	Hard-ware/Software/Small Water Enterprise	Africa	Yesb	Yes
Gates Foundation	Donor	Global	No	N/A
Ghana Water Com-pany Limited (GWCL)	Hardware/Software	Africa	Yes	Yes
Grundfos	Urban Utility	Africa	No	Yes
Jibu	Small Water Enterprise	Africa	Yesc	Noa
Kisumu Water and Sanitation Company (KIWASCO)	Urban Utility	Africa	Yes	Yes
Loowatt	Container Sanitation	Africa	Yes	Yes
Manobi	Hardware/Software/ Small Water Enterprise	Africa	Yesb	Yes
Nairobi City Water and Sewage Company (NCWSC)	Urban Utility	Africa	Yes	Yes
NextDrop	Hardware/Software	Asia	No	No
Safe Water Net-work	Hardware/Software	Africa, Asia	Yes	Yes
Sarvajal	Small Water Enterprise	Asia	Yesc	No
SeeSaw	Hardware/Software	Africa, Asia	No	No
Société d'Exploitation des Eaux du Niger (SEEN)	Small Water Enterprise	Africa	Yes	Yes

continued

NAME	TYPE	REGION	CUSTOMER-FACING WSS PROVIDER?	FACILITATES/ ACCEPTS DIGITAL PAYMENTS FROM END USERS?
SOIL	Urban Utility	Latin America	Yes	Yes
Susteq	Sanitation Provider	Global	No	Yes
Water Forever	Hardware/Software	Africa	No	Yes
Water4	Small Water Enterprise	Africa, Latin America	Yes	No
WellDone	Hardware/Software	Global	No	No
Wonderkid	Software	Africa	No	Yes

ENTITY	TYPE	INTERVIEWEE	COUNTRIES WITH WATER ENGAGEMENTS
1,001 fontaines	Small Water Enterprise	Lori Gonnu	Cambodia, Madagascar, India
CityTaps	Hardware/Software	Grégoire Landel	Niger
Cubo Environmental Technologies	Hardware	Rui Bras Gomes	Global
Drinkwell	Small Water Enterprise	Ataur Rahman	India, Bangladesh
eWaterPay	Hardware/Software	Rob Hygate	Gambia, Tanzania, Ghana
Gates Foundation	Donor	Alyse Schrecongost	Global
Kisumu Water and Sanitation Company (KIWASCO)	Urban Utility	Eldah Odhiambo	Kenya
Loowatt	Container Sanitation	Mary Roach	Madagascar
Manobi	Hardware/Software	Daniel Annerose	Benin, Senegal
NextDrop	Hardware/Software	Anu Sridharan	India
Safe Water Network	Small Water Enterprise	Charles Yeboah and Sandy Hwang	India, Ghana
Sarvajal	Small Water Enterprise	Anuj Sharma	India
SeeSaw	Hardware/Software	David Schaub-Jones	Angola, DRC, South Africa, Cambodia, Vietnam
SOIL	Sanitation Provider	Erica Lloyd	Haiti
Susteq	Hardware/Software	Marten Susebeek	Global
Water Forever	Hardware/Software	Marcel Scheurs and Florence Ngore	Kenya, Uganda
WellDone	Hardware/Software	Addison Nuding	Global
Wonderkid	Software	Halima Murunga, Dickson Marira, and Daniel Kamiri	Kenya, Nigeria
Nairobi City Water and Sewage Company (NCWSC)	Urban Utility	Rachael Ngethe	Kenya
Ghana Water Company Limited (GWCL)	Urban Utility	Richard Appiah Otoo and Faustina Boachie	Ghana
Grundfos	Hardware/Software	Jesper Lorenzen	Kenya, Tanzania, Ghana
Société d'Exploitation des Eaux du Niger (SEEN)	Urban Utility	Ibrahim Akine Atta II	Niger
Water4	Small Water Enterprise	Matt Hangen and Dennis Ripley	Burkina Faso, DRC, Ghana, Kenya, Liberia, Malawi, Rwanda, Sierra Leone, Tanzania, Togo, Uganda, Zambia, Peru
Clean Team	Container Sanitation	Kelvin Hughes	Ghana
Jibu	Small Water Enterprise	David Kawaida	Kenya, Uganda, Rwanda, Tanzania, Zimbabwe

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