

Pay-As-You-Go model brings millions into financial inclusion

Unlocking a financial pathway for
underserved individuals through
energy access

Summary

In 2012, M-KOPA Solar pioneered an innovative approach to energy delivery in East Africa. Combining solar power, IoT security, mobile payments, and a motivated sales and support network, M-KOPA expanded financial inclusion to unbanked customers without any credit history. Now low-income Africans are realising savings, establishing creditworthiness, and improving livelihoods.

Over 3.3 million people throughout Kenya, Uganda, and Tanzania have benefitted from the pay-as-you-go (PAYG) solar service that M-KOPA designed for those living without access to the electricity grid.

The PAYG model is commercially scalable and has the potential to reach millions more underserved individuals who require flexible financing to purchase previously unaffordable products, such as solar lighting for off-grid households or productive use appliances for micro-enterprises.

This paper highlights the impact of M-KOPA's PAYG model on financial inclusion for consumers at the base of the pyramid (BOP), focussing on four critical levers:

- **Lever 1:** Increased savings for economic resilience and freedom.
- **Lever 2:** Access to credit brings BOP customers further into digital financial age.
- **Lever 3:** Income creation opportunities.
- **Lever 4:** Non-punitive approach to asset financing.

This paper also explores the possible future of PAYG solutions as M-KOPA scales to serve more BOP households and micro-enterprises, including: increasing the range of product offerings; further enhancing affordability; and creating B2B solutions.

Table of contents

Summary	2
Lighting the way to financial inclusion	4
Lever 1: Increased savings for investments in improved quality of life	4
Lever 2: Access to credit brings BOP individuals further into digital financial age	6
Lever 3: Income generation reduces risk and supports upward mobility	8
Lever 4: Non-punitive approach to asset financing drives adoption	9
PAYG journey: Looking back	10
Convergence of technological innovations led the way to PAYG solar	10
Scale gives confidence to on-lend	10
PAYG journey: Looking forward	12
Driving distribution of PAYG products – digitally and physically	12
Increasing financial inclusion at the base of the pyramid	12
Strides toward commercial sustainability	13
Risk management strategies for emerging PAYG players	13
Conclusion	15

Lighting the way to financial inclusion

Unbanked individuals in rural Africa are particularly vulnerable to economic shocks and cash volatility. M-KOPA has designed a scalable business model that suits the financial contexts of individuals who:

- reside in rural settings: 10 kilometres (median) from the closest town and services,
- live in a household of 2 adults and 3 children,
- have an average monthly family earning of ~\$100, and
- save around \$10 per month by displacing toxic kerosene with M-KOPA's solar system¹.

Lever 1: Increased savings for investments in improved quality of life

Off-grid households in Kenya dedicate 5-10% of their total cash spend² on either toxic kerosene lanterns, poor-quality torches, or candles.

Recognising the universal need for affordable, clean, safe electricity, M-KOPA brought to market a solar energy solution that enables customers to save between \$4-5 per week on average³ and can be repaid over time. The combination of affordability, flexibility and savings supports customer's financial resilience to unexpected shocks and the ability to save available cash for larger, lumpy expenses, like school fees. As illustrated in Figure 1 kerosene, phone charging, and radio batteries drive over 90 per cent of user's energy consumption, with kerosene accounting for over 50 per cent of total energy costs⁴.

1 Savings defined as avoided expenditure

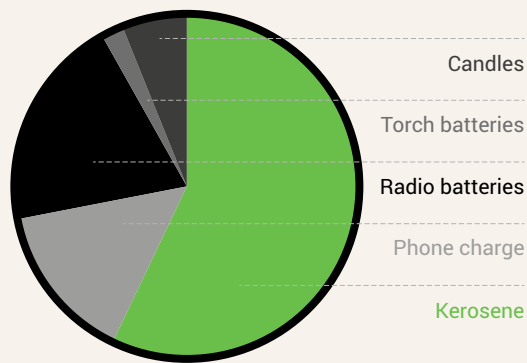
2 <https://phys.org/news/2017-07-impact-solar-rural-kenya.html>

3 M-KOPA Solar Customer Survey June 2015

4 M-KOPA Solar Light Bulb Series Paper, April 2014

Figure 1: Pre-M-KOPA

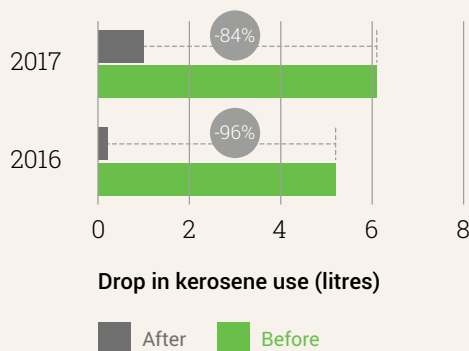
Total expenditure across energy sources⁵



M-KOPA solar systems allow households to drastically reduce spend on kerosene by 90% on average⁶.

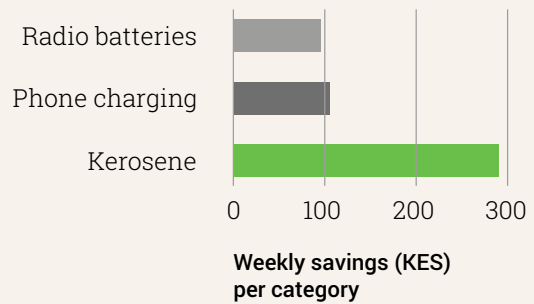
Figure 2: Post-M-KOPA

Change in energy consumption and costs



Users report weekly savings of \$4.50 (62% of total savings) directly attributable to M-KOPA system ownership⁷.

Figure 3: Weekly savings experienced by M-KOPA customers



90%

Avg. % drop in kerosene use

458 KES

Avg. weekly savings from M-KOPA

5 M-KOPA Solar Light Bulb Series Paper, April 2014

6 M-KOPA Solar Survey December 2017

7 M-KOPA Solar Customer Survey June 2015

Lever 2: Access to credit brings BOP individuals further into digital financial age

Accessing financial services remains one of the greatest barriers for BOP individuals for reasons ranging from lack of collateral, low financial literacy, and non-existent borrowing histories. The proliferation of mobile money accounts, beginning with M-Pesa in Kenya, catalysed the digitisation of payments, effectively creating a current account for unbanked consumers and serving as a channel for remittances.

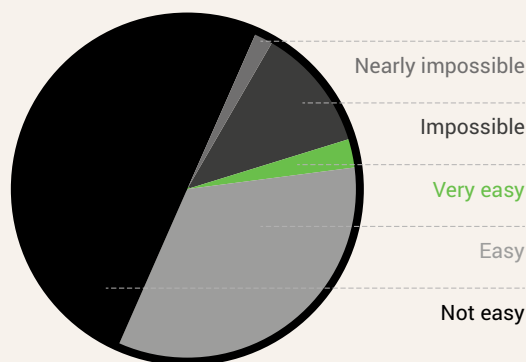
Mobile money accounts solved a much-needed payment pain point. Still unbanked individuals must depend on informal savings groups or risky mechanisms to safeguard and grow cash for the future. M-KOPA's PAYG model alleviates the trade-off decisions low-income consumers face when they have available cash, allowing for deferred payments for vital goods, e.g., choosing between school fees and fertilizer at sowing season.

Technology leapfrogs asset reclamation

Rural households in East Africa own few assets that can be secured as collateral against loans from traditional financial institutions. Advance digital technologies, namely machine-to-machine communications and Internet of Things (IoT), tackle a key problem in extending credit for BOP users.

Ninety-nine percent of individuals who purchase an M-KOPA solar system do so on a credit basis and without the need to collateralise high-value goods that can be repossessed in default – a near impossible task in rural settings of East Africa. Instead, M-KOPA confidently lends to these consumers by embedding a GSM chip into each device, making it possible to remotely turn off the system at times of non-payment.

Figure 4: User's ability to access loans



A significant proportion of population (64%) find it difficult to access loans from traditional financial institutions.

(64% falling between "Not Easy", "Nearly Impossible" and "Impossible")⁸

Once customers complete payment of their solar system, they can acquire credit for additional products by allowing M-KOPA to maintain control of the solar system in case payments cease.

This technology-enabled approach to financial inclusion has led to nearly one in five M-KOPA customers upgrading to low-energy TVs⁹, clean-burning cookstoves, smartphones, and other digital financial offerings like e-coupons for agricultural inputs.

8 M-KOPA Solar Customer Survey February 2015

9 As of January 2019

Box 1:

Lighting the way toward women's economic empowerment

Landholding rights, social norms, and lack of education are a few of the barriers women face when accessing financial services. In Kenya, women-headed households are twice as likely to be financially-excluded than those in the financial inclusion fold, according to CGAP.

PAYG financing is not a silver bullet but providing access to credit is a strong tool for women to build their own futures.

Fifty percent of M-KOPA's customers in Kenya are female, and the majority are establishing credit scores. Forty-six per cent of all customers report women benefit most from the solar system by avoiding hours previously spent collecting kerosene (typically a daily two-hour chore) and benefitting from watching informative TV, like the news.

Women also account for nearly half of our Kenyan sales force. Notably, of the top 100-performing agents, women outperform their male counterparts, consistently.



Digital credit scores unlock the financial ecosystem

As customers make daily payments to M-KOPA, they develop a credit history. By sharing customers' credit performance with the Credit Reference Bureau (as is the case in Kenya¹⁰), M-KOPA allows customers to borrow from other financial service providers. Over the past six years, we have seen an increasing portion of customers take additional loans through the Kenya Credit Reference Bureau, rising from 10 to 80 per cent.

Existing repayment performance data provide the evidence for banks and financial institutions to assess low-income consumer's risk profile and confidently lend. This eliminates the negative bias that BOP consumers face and gives consumers access to more affordable lending rates from the larger banking actors – a key indicator of economic growth in developing markets¹¹.

¹⁰ Credit data shared with Kenya CRB in accordance with local law and with customers' consent

¹¹ http://siteresources.worldbank.org/FINANCIALSECTOR/539914-1118439900885/20700929/Indicators_of_Financial_Access_Household_Level_Surveys.pdf

Lever 3: Income generation reduces credit risk and supports upward mobility

Customers can generate additional earnings. Higher incomes also make customers more attractive to other formal financial players, due to their increased repayment capability. Further, M-KOPA has recruited and trained some 2,000 sales agents and field technicians across Kenya and Uganda to distribute solar home systems and creating informal to formal sector employment pathways.

Powering income generation

The bulk of additional earnings are driven by added productive hours, such as operating a store for more hours. M-KOPA also enables people to create additional income from the comfort of their homes, for businesses ranging from cell-phone charging spots to movie theatres¹². Customers on average earn an additional ~\$65 USD per month.¹³

Employment within local communities

M-KOPA's sales agents, typically youths under the age of 35, are recruited from the communities in which they serve. These entrepreneurial youths, nearly 50% of whom are female (in Kenya), gravitate to M-KOPA to earn comparatively high incomes not available in informal markets. Through a robust, continual training programme, hundreds of agents have been promoted to full-time management roles, further boosting incomes on the pathway to financial independence.

Figure 5: Households' ability to generate income

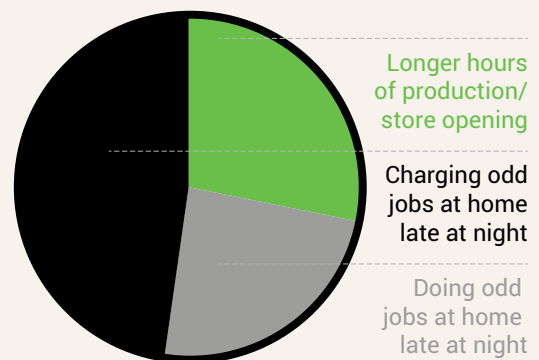
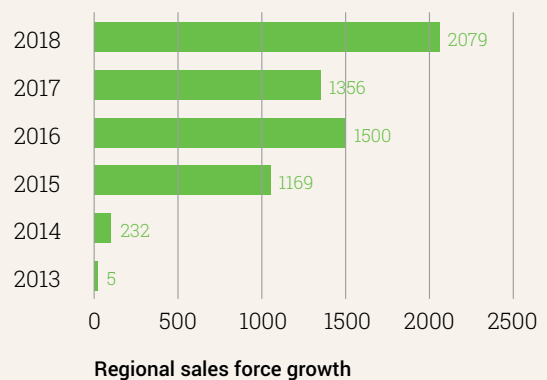


Figure 6: Demand for PAYG solar creates last-mile employment opportunities



46%

% of households use their M-KOPA SHS to generate revenue or support income-generating activities¹³

\$65 USD

Avg. additional household income generated per month from M-KOPA solar solution

¹² M-KOPA Solar June 2015 Customer Survey

¹³ GOGLA survey conducted for M-KOPA by Altai Consulting

Lever 4: Non-punitive approach to asset financing drives adoption

M-KOPA's PAYG model is a highly flexible, non-punitive approach to asset financing. The benefits of this model to low-income customers are set out in Table 1.

Table 1: PAYG features and customer benefits of PAYG structure

Key aspect of the PAYG model	Benefits to cash-constrained customers
Flexibility on loan completion period , with incentives for completing sooner (early payment discount), yet no downside for taking longer (cost of 365 energy days is the same whether purchased over 12, 14 or even 18 months).	Customers are informed that the loan commitment is to a fixed number of days, not a time commitment. This provides flexibility to stretch or compress timelines based on cash availability. This makes it possible for those with less predictable or volatile incomes to complete their purchase.
Non-compounding model, with no accruing balances for unpaid days.	Customers avoid punitive effects of compounding on accrued balances in times of non-payment. A loan duration may increase in length if customers cannot pay daily, but M-KOPA never layers interest on top of extended days.
Adjust payments , based on expected days used.	Consumers can pre-pay in times of liquidity to ensure continuity of service or take advantage of a 30-day grace period , without any negative consequence to loan terms.

PAYG journey: Looking back

In only six years, PAYG financing has opened up new financial pathways for millions of low-income individuals globally and catalysed a marketplace for life-enhancing goods. Several important technological innovations preceded and enabled M-KOPA's breakthrough in financial inclusion with energy access.

Convergence of technological innovations led the way to PAYG solar

PAYG solar in Africa was born out of the wide-spread adoption of mobile phones, high penetration of digital payments and the plummeting costs of solar PV and LED lighting. M-KOPA's founders knitted these enabling factors together with a GSM SIM card inside a solar home system to allow for remote machine-to-machine communication, IoT control, receipt of payments and device crediting, and delivery of reliable energy services.

Like most pioneers, M-KOPA built and designed core components of its operations from the ground up. This includes its cloud-based platform, M-KOPANet, that remotely monitors systems' performance, synchronises mobile money payments with devices, and measures repayment performance for every account. However, strategic partnerships with innovators in adjacent markets have played key roles in M-KOPA's aim to reach one million low-income customers by 2020. These include the following:

Mobile payment innovators

- Vodafone and Safaricom created and scaled M-Pesa, a highly successful mobile payment system without which M-KOPA would not have been viable.
- MTN and AirTel scaled mobile money platforms in several African countries, including Uganda, one of the most active markets for PAYG solar in the world.

Hardware innovators

- Philips Lighting brought incredibly cost-efficient LED lights to market.
- The solar panel and battery cell manufacturing market continue to bring costs down for PAYG solar providers.

Software innovators

- Microsoft whose platforms provide the backbone for M-KOPA's operations from R&D to customer service. For example, Kaizala supports management of a large, widely-dispersed sales agent force through real-time communication in 2G networks, while Azure securely enables M-KOPA's to transact 90 thousand payments daily.

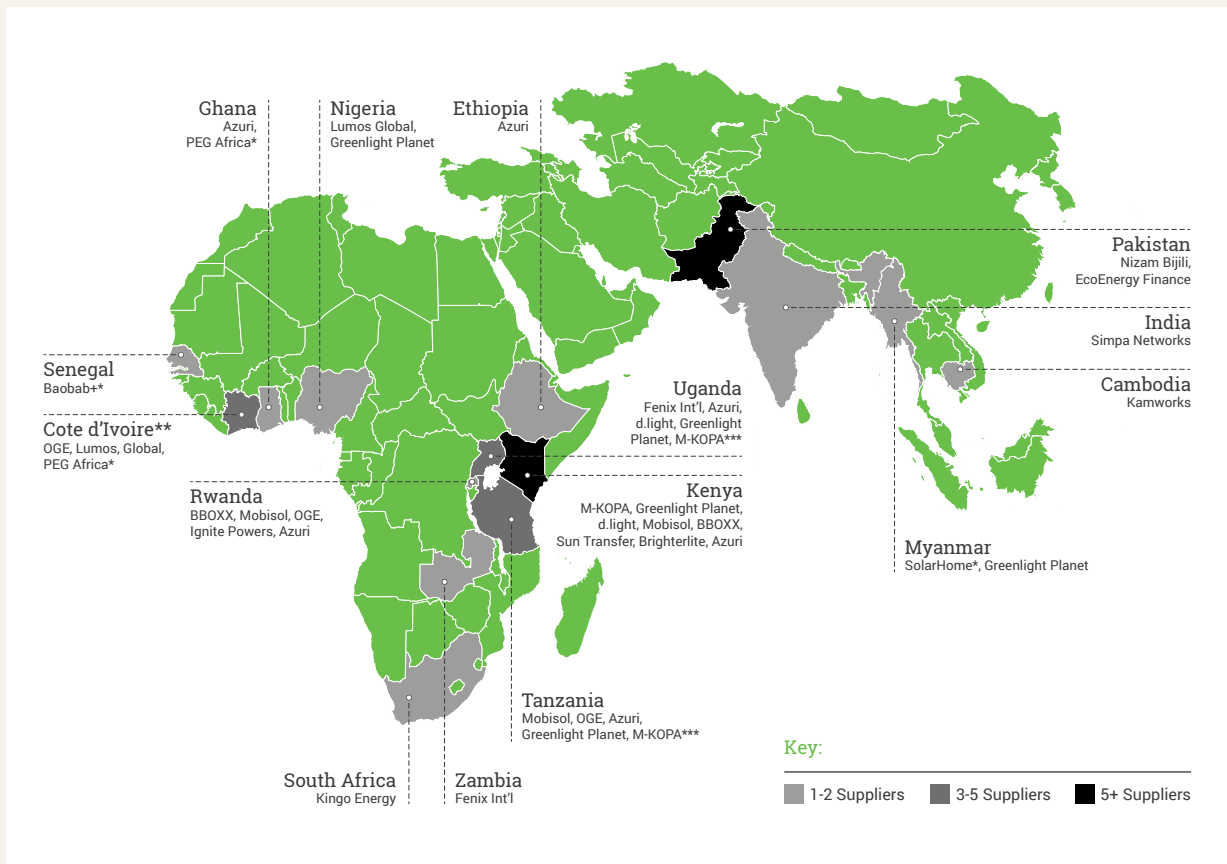
Scale gives confidence to on-lend

A growing customer base provides an increasingly insightful pool of data, which M-KOPA can analyse to generate important insights and identify alternative metrics for creditworthiness, thus making offerings more accessible to low-income individuals.

For example, M-KOPA is exploring how current customers can upgrade to higher-value offerings without the need for a large deposit by evaluating a customer's dependency on the solar system. We hypothesize customers who use their solar device more often are more dependent on their system for power and, therefore, are more likely to honour repayments. This insight will be particularly beneficial for households living in the most remote areas of East Africa, where electric grid extension is implausible.

For future customers, this has implications on deposit requirements, which are a limiting factor in adoption (but necessary to de-risk credit provision). Research in this area is still under development and will continue to be enhanced as M-KOPA introduces lower-priced solutions to the market.

Figure 6: Majority of PAYG solar offerings concentrated in East Africa, where high mobile money adoption is high, an enabling factor for PAYG functionality¹⁴



PAYG journey: Looking forward

PAYG financing began with solar system, but there is an attractive opportunity to apply flexible payment plans for many 'first-step' products.

Already world-class hardware developers are taking note of the promising PAYG market and stepping into the space with made-for-market innovations, including:

- Solar-powered fridges: Embraco, the world's leading player in cooling technology, collaborated with M-KOPA for two years to create hyper-efficient refrigerators capable of running solely on solar power.
- Solar-powered water heaters: Bosch is leveraging advancements in the hardware design industry to create water heating solutions that can affordably run on solar power to minimise energy loss and maximise efficiency.

Driving distribution of PAYG products – digitally and physically

High-quality hardware is one dimension of the value proposition to underserved households and enterprises. Channels to market and IT infrastructure are two business-to-business opportunities that PAYG providers can pursue.

PAYG platform-as-a-service

M-KOPA has undertaken significant investments in both technology and IT infrastructure to successfully scale a PAYG cloud-based platform – capable of simultaneously monitoring multiple currencies, payment plans, and analytics across millions of devices.

M-KOPA is now exploring whether hardware developers can adopt M-KOPA's PAYG platform rather than recreate investments. Adopting existing, proven platforms, rather than duplicating investments, stands to catalyse the market for PAYG products by eliminating the technical and capital barriers for developers.

Dual wholesale and retail models

Many PAYG solar companies, including M-KOPA, run vertically-integrated operations to maintain control over the customer relationship and last-mile distribution. This represents the hardest, yet most valuable point along the value chain in emerging markets. Companies seeking to target rural, underserved populations in developing countries need not forge their own routes to market.

Leveraging the well-established distribution channels of existing companies may provide as a fast track to reach consumers for new entrants marketing complementary products.

Increasing financial inclusion at the base of the pyramid

Despite the strides towards universal financial inclusion and energy access, there is still a significant portion of consumers for whom current multi-lighting systems remain out of reach.

Creation and adoption of lower-priced PAYG solutions, beyond solar home systems, will act as the first step for very low-income individuals to progress up the ladder to higher-value products. This represents a large commercial opportunity for hardware providers to test and identify PAYG appliances and goods that provide a substantial degree of value to customers. Equally, an anchoring PAYG product must be commercially attractive to providers with high volume sales to consumers or low marginal costs, such as connectivity services.

Strides toward commercial sustainability

By 2019, more than twenty companies have commercialised PAYG solar offerings to meet the enormous demand for kerosene-displacing lighting and low-energy appliances. From larger systems for off-grid enterprises by Greenlight Planet to one-light systems by d.light, middle and low-income consumers have no shortage of solar lighting offerings.

The industry is converging toward multi-light solutions that anchor a credit relationship with underserved individuals, at the same time as customer needs and tastes are adjusting upwards with increasing financial stability. This signifies latent demand for higher-order energy services, as seen with the launch and adoption of solar-powered TVs and low-power fans, stereos, and other electronics, including M-KOPA's forthcoming PAYG solar-powered refrigerator.

Donors continue to play a pivotal role in supporting research and development initiatives that lead to breakthroughs in affordability and availability of household or productive use assets that further realise savings or income-generation opportunities for bottom of the pyramid populations. For instance, the Bill and Melinda Gates Foundation provided M-KOPA with seed funding to test the PAYG proposition in the market. This early support for an untested business model allowed M-KOPA to prove the potential for underserved households to uplift themselves from poverty with a micro-loan empathetically designed to work for, not against, the cash constraints of low-income individuals. Today, 80% of M-KOPA's customers earn \$2.00 or less per day and save roughly \$180 per year from owning a solar system.

Risk management strategies for emerging PAYG players

PAYG lenders must manage risk in their accounts. M-KOPA maintains an intense focus on data-driven insights. Areas of focus include the following.

Managing risk in the short to medium term, for scale:

- Social ties act as a proxy for market intelligence. Hiring sales agents from the local areas nurtures relationships with customers (who know the sales people personally) and helps communicate product features and payment plans in terms and language that is familiar and relevant, fostering trust.
- Quality of service is inextricably linked to lender risk. Customers vote with their daily repayments in the PAYG model. If they do not like the service, they simply stop paying for it. Therefore, providers cannot afford to bring low-quality products to market or skimp on back-end remote monitoring capabilities and customer care teams.
- M2M functionality leapfrogs collateral. IoT communication enables control over the credit relationship with a remote on/off disabling feature should consumers cease paying; functionality can be extended to innovations suited to low-income consumers around the world.
- Appropriate pricing strategies ensure offerings are comfortably within the reach of BOP customers and, thus, minimise risk of defaulting due to inability to pay.

Strides toward commercial sustainability

Managing risk in the medium to long term, for sustainability:

Data analytics allow for accurate creditworthiness assessments for previously unserved customers and management of non-performing loans. The gathering of such data keeps M-KOPA at the cutting edge of loan-maintenance strategies. Priority areas for exploration as the company strives for one million customers by 2020 include:

- Lifetime device performance: a clear understanding of wear-and-tear and, thus, the extent to which goods can be secured over their lifetimes, and
- Loan performance: key indicators based on behaviour, dependence, and use of devices to extend and expand the longer-term credit relationship with customers or uncover trends that reveal potential risks across the loan portfolio (e.g., seasonality demand spikes that lead to long-term credit loss).

Conclusion

M-KOPA's PAYG model has created a new market that has brought millions of customers into financial inclusion.

The four biggest levers in achieving this were:

- Lever 1: Increased savings among users
- Lever 2: Ability to access credit
- Lever 3: Creation of income
- Lever 4: Non-punitive approach to asset financing

The success of M-KOPA's PAYG model has catalysed a global industry, resulting in the emergence of several players offering PAYG asset financing to previously underserved households and micro-entrepreneurs. Despite this growth, the industry is still in its early days, with tremendous room for investment and donor support to scale financial inclusion through the proliferation of a broad, inclusive PAYG appliance portfolio.

Looking beyond M-KOPA, a focus on gathering data is critical in order to build the customer and product insights that allow the industry to achieve profitability and sustainability.