KopaGas
Mobile-enabled Pay-as-you-Cook™ service in Tanzania

kopagas.com

KopaGas is developing the next generation Liquid Petroleum Gas (LPG) canister meters equipped with machine-to-machine (M2M) technology in order to enable medium and low-income households to switch away from dirty and expensive charcoal. Their business model eliminates upfront costs and allows customers to pre-pay for the quantities of gas that fit their budget, improving their financial planning and their family health.

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KopaGas

GSMA Mobile for Development Utilities Seed Grant 2015–17
Mobile-enabled Pay-as-you-Cook™ service in **Tanzania**

USE OF MOBILE

M2M connectivity

Mobile Payments Mobile Money

KopaGas designed a smart meter for gas cylinders and deployed a Pay-as-you-Cook™ service in Dar es Salaam, Tanzania in partnership with Oryx Energies. The service uses machine-to-machine (M2M) connectivity to monitor and control gas usage and customers use mobile money to purchase gas in affordable quantities for clean cooking.

The Pay-as-you-Cook™ pilot improved access to clean cooking fuel for 148 households and 2 small-scale food stands for a total reach of 870 people.

PROJECT OUTCOMES

48% of KopaGas customers are under the USD 3.10 per day poverty line and 96% are saving USD 2.92 per week on cooking fuel.

The cylinder turnover ratio (number of times cylinders are refilled in a year) is more than twice the industry standard in Tanzania.

Customers are purchasing gas with mobile money every 5 days on average and **98%** are women.

KEY PROJECT LESSONS

The Pay-as-you-Cook™ service removes affordability barriers to clean cooking fuel for low-income households.

M2M technology enables continuous availability of gas to create a better user experience and a sound business model.

Gender-inclusive marketing and distribution are used to successfully target female customers.

Kopagas has licensed their technology to Envirofit International in Ghana and Kenya, whilst continuing to scale the service in Dar es Salaam.

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7 AFFORDABLE AND CLEAN ENERGY

Overview of the grant project

In 2015, the GSMA Mobile for Development Utilities Programme awarded an Innovation Fund grant to KopaGas to design a low-cost meter for Liquid Petroleum Gas (LPG) canisters and test a pay-as-you-go (PAYG) cooking gas service with 150 households in Tanzania. Today, only five per cent[1] of Tanzanian households are using LPG consistently. Investing in a gas cylinder, stove and accessories represents a USD 60 to 100 investment, the equivalent of 20 to 30 days of income for a household living on less than USD 3.10 per person per day, and the refilling costs for a full cylinder represent an additional seven to 15 days of income.[2] KopaGas aimed to deploy a Pay-as-you-Cook™ service model for customers who cannot meet the upfront expense and refilling costs so they can afford clean cooking gas for as little TZS 1,000 (USD 0.45) per day.

> *"Many 'normal' gas users have cylinders as furniture because they cannot afford to refill their 6kg / 15kg canisters."*
>
> **MALE KOPAGAS USER, MWENGE**

KopaGas recruited PAYG customers for the pilot through women's savings and credit cooperatives (SACCOs), which raised awareness through demonstrations and seminars, recruited customers and introduced them to a KopaGas sales and customer service agent. Customers paid TZS 10,000 (USD 4.50) to register and an optional TZS 20,000 (USD 9) for a stove sold on commission by the SACCO. The smart meter, gas cylinder and unsold portion of gas remained the property of KopaGas while customers had access to the gas they had paid for. The PAYG service included cylinder delivery to the customer's home.

> *"They brought the canister and cooker home, asked me where to place it, showed me how to buy gas, use the stove and read the meter, gave me a leaflet with the same instructions and a phone number to call in case I did not understand or if I experienced any problems."*
>
> **MALE KOPAGAS USER, MWENGE**

KopaGas partnered with Oryx Energies, a leading LPG marketer in sub-Saharan Africa, to source and distribute gas canisters in Dar es Salaam. For the PAYG service, KopaGas designed a smart meter to be fitted onto household gas cylinders.

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1. Sources: KopaGas. Richenda Van Leeuwen, Alex Evans and Besnik Hyseni, 2017, "Increasing the use of liquefied petroleum gas in cooking in developing countries," https://openknowledge.worldbank.org/bitstream/handle/10986/26569/114846-BRI-PUBLIC-add-series-VC-LWLJfinOKR.pdf?sequence=5
2. Source: KopaGas

Service design and use of mobile channels

The PAYG service used mobile money and GSM machine-to-machine (M2M) connectivity.

| Mobile money

Customers used mobile money, specifically Vodacom's M-Pesa, for their gas purchases. Payment information was sent from the mobile money platform to the KopaGas cloud servers, which then updated the smart meter in real time using GSM M2M connectivity (see Figure 1).

| Machine-to-Machine connectivity

The smart meter used SMS to communicate over the mobile network with the KopaGas cloud servers. KopaGas initially chose SMS for M2M connectivity to develop an easy communication protocol that allowed its field staff to help debug and improve workflows and the user interface. They will be moving to mobile data (GPRS) for future deployments.

The meters periodically relayed information on gas consumption, cylinder usage and battery levels. When a cylinder was nearly empty (as measured by the meter), the meter generated a message, prompting KopaGas staff to deliver a full cylinder. The meters were also updated with credit information when a payment was made by mobile money. As shown in Figure 2, the meter display showed the time, gas remaining (GR) (two much-appreciated features), credit available in TZS (CR), battery level (BL) and

volume of gas used (VU). They were also fitted with anti-tampering and other safety functions. Only KopaGas technicians could open the meters, and when they switched cylinders, they sent an unlock command from their mobile app that was relayed to the cloud and eventually to the meter.

KopaGas smart meters are battery powered, so when battery levels were low, an SMS warning was sent to the customer to prompt them to recharge the battery by plugging in the meter, allowing it to continue functioning. The battery lasted approximately two months in a normal duty cycle.

The main challenge was striking the right balance between servicing the battery, gathering data and the user interface energy requirements. During the pilot, data was extracted at 15-minute intervals to understand customer behaviour and LPG usage for cooking sessions throughout the day.

In addition to these mobile channels, and outside the scope of the grant, KopaGas developed a mobile app for drivers at its traditional gas distribution business, which began operating at the same time as the grant. This mobile app allowed KopaGas to map its distribution routes and was also used by drivers to collect payments from non-PAYG customers. KopaGas thus made extensive use of mobile technology throughout their business processes.

FIGURE 1

Pay-as-you-Cook™ service

- Customer makes a mobile money payment for the KopaGas service
- Mobile money platform
- KopaGas cloud servers
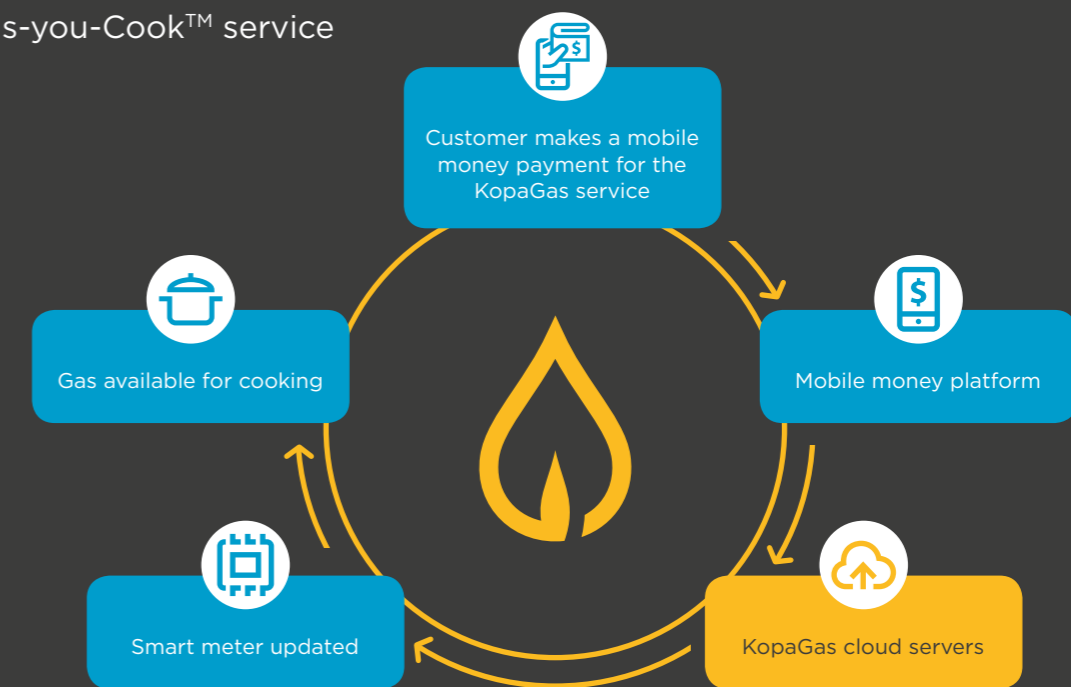- Smart meter updated
- Gas available for cooking

FIGURE 2

KopaGas LPG smart meter

Photo credit: GSMA, Havis Research Company

Lessons from the project

3 | The Pay-as-you-Cook™ service uses gender-specific marketing and distribution to target women

KopaGas customers are 98 per cent women (Figure 3). By working with a women-run SACCO, KopaGas was able to shift the marketing, training and pre-sales responsibilities to them and target entrepreneurial women. Another benefit was the high number of customers who typically belong to a SACCO, which made distribution and post-sales support cost-effective. KopaGas also observed that their female technician received more calls and a higher rating than the other two male technicians. KopaGas plans to develop the technical skills of their female staff to serve their predominantly female customer base.

4 | The Pay-as-you-Cook™ service removes affordability barriers to clean cooking fuel for low-income households

An Acumen survey found that 48 per cent of households lived below the poverty line of USD 3.10 per person per day and 96 per cent of KopaGas customers saved an average of USD 2.92 per week on cooking fuel. For an equivalent amount of cooking, LPG can be up to 30 per cent cheaper than charcoal, especially for low-income households that make small daily purchases of gas. In Dar es Salaam, the typical household spends more than USD 30 per month on charcoal. Ninety-eight per cent of respondents consider the KopaGas service very good or good value for money and 63 per cent reported their quality of life had "very much improved" for reasons shown in Figure 5. Qualitative surveys (see quotes below) also show that customers valued the time savings of cooking with gas instead of charcoal.

1 | The mobile money-based Pay-as-you-Cook™ service leads to a "digital diversion" of cooking fuel expenditures, from charcoal paid in cash to LPG paid by mobile money

KopaGas launched the Pay-as-you-Cook™ service to five customers as a trial in December 2016 and rolled out the service to 148 households and two businesses by August 2017 (see Figure 3).

The average payment value increased as new customers joined the service since the typical initial purchase was TZS 5,000 (USD 2.25) worth of gas (see Figure 4).

At the time of the baseline survey, 27.5 per cent of respondents did not use mobile money for service and utility payments. Seventy-one per cent of customers had previously used charcoal or firewood for cooking, which they paid for in cash.[3] Over the course of the pilot, all customers were active each month, they only lacked access to gas one day out of the month and purchased gas through mobile money every five days on average. The mobile money-based Pay-as-you-Cook™ service thus led to a "digital diversion" of fuel expenditures from charcoal paid in cash to LPG paid by mobile money.

2 | The Pay-as-you-Cook™ service leverages M2M data to create a better user experience and a sound business model

Thanks to information on gas consumption collected by the meters and transmitted via GSM M2M, KopaGas was able to set up processes to replace empty cylinders within one day. This led to a better user experience, as users would otherwise have to hire motorcycle taxis to replace their cylinders, adding to the cost of using gas for cooking. Another crucially important benefit of the M2M data was its impact on the cylinder turnover ratio or the number of times a cylinder is refilled and used in one year. This metric measures both the efficiency of distribution (how distributors are managing their cylinder inventory) and profit linked to gas consumption. By utilising M2M data for the Pay-as-you-Cook™ service, KopaGas was able to increase cylinder turnover to 8.6 refills and uses per cylinder per year whereas the industry average in Tanzania is no more than four. This in turn increases profits and makes it an attractive model for companies like Oryx Energies.

FEEDBACK FROM KOPAGAS CUSTOMERS:

"I did not have gas for one-and-a-half months because I did not have the money to refill; now even if I have TZS 5,000, I can get gas."
– FEMALE USER, KINONDONI

"Charcoal is sold in TZS 1,500, 2000, 4,000 [SKUs]; the same amounts can be used to pay for [PAYG] gas [because] typical purchases are TZS 1,000, 1,500, 2,000 and 5,000."
– FEMALE USER, MWENGE

"Charcoal buying was a daily activity. TZS 2,000 to 3,000 worth of charcoal was typically used in one day when preparing different foods; for the same amount, I can use gas for more than three days. This is saving us money."
– FEMALE USER, MWANANYAMALA

"30 minutes compared to 3 hours cooking time [means an] easier home life."
– FEMALE USER, MWENGE

"Since I have got KopaGas, my life has become so much easier because I can eat whatever I want because before, my food budget was affected much by the charcoal price."
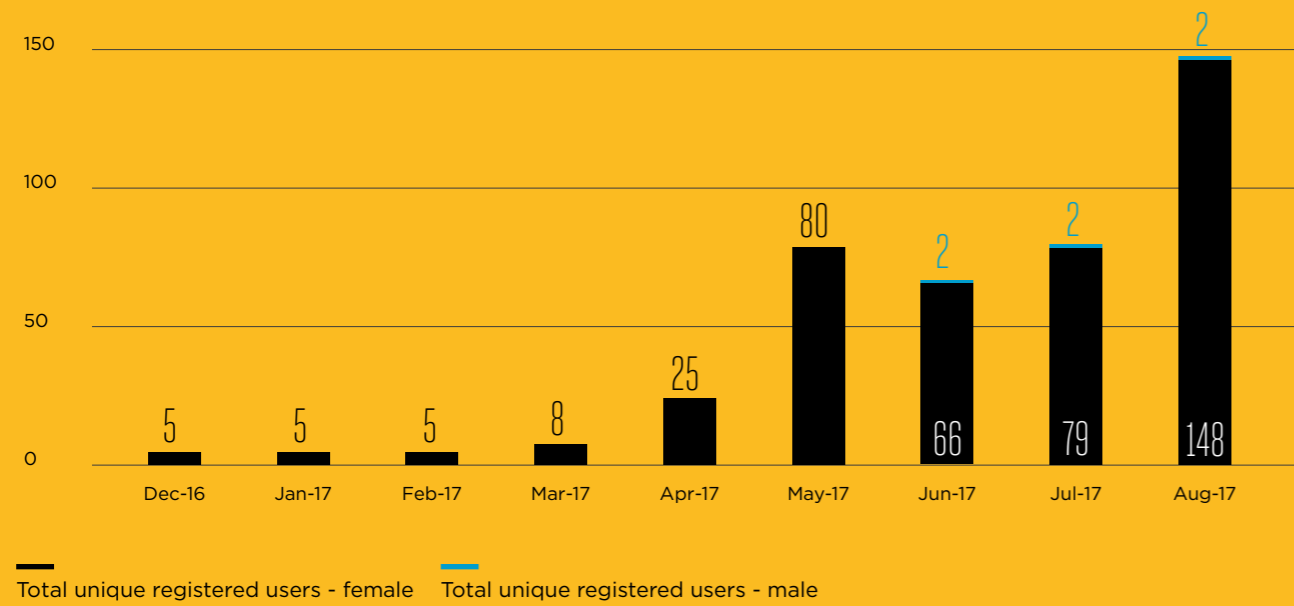**– HANSILA CHIKOTO**

"Because it makes me to save time and make my house to be clean all the time since there is no soot and other dirt which can be the cause with charcoal."
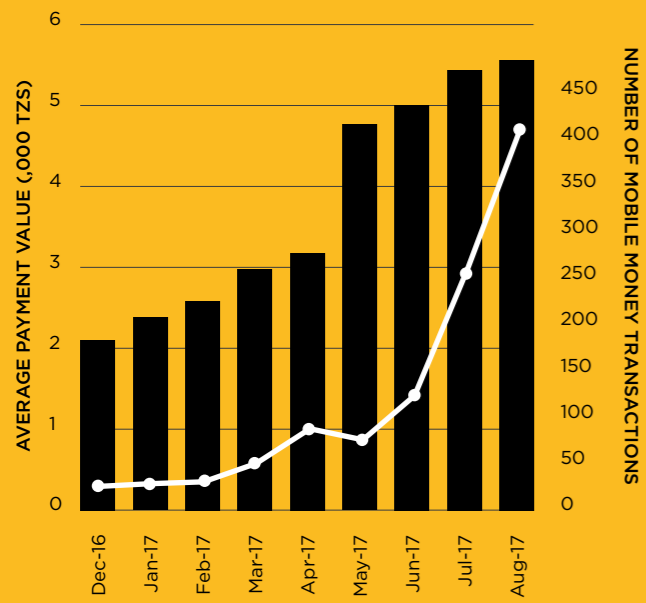**– UPENDO ABRAHAM**

3.   Source: Acumen

FIGURE 3

KopaGas service adoption

Legend: Total unique registered users - female   Total unique registered users - male

Values shown (female / male):
- Dec-16: 5
- Jan-17: 5
- Feb-17: 5
- Mar-17: 8
- Apr-17: 25
- May-17: 80
- Jun-17: 66 / 2
- Jul-17: 79 / 2
- Aug-17: 148 / 2

Source: KopaGas

FIGURE 4

Mobile money adoption

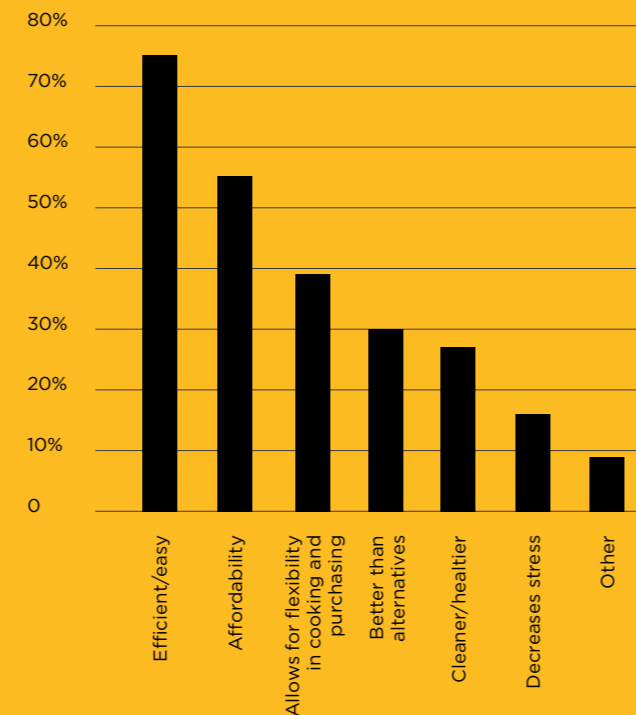AVERAGE PAYMENT VALUE (,000 TZS) / NUMBER OF MOBILE MONEY TRANSACTIONS

Number of mobile money transactions

Source: KopaGas

FIGURE 5

Impact on quality of life

POSITIVE CHANGES MENTIONED BY CUSTOMERS

Categories: Efficient/easy, Affordability, Allows for flexibility in cooking and purchasing, Better than alternatives, Cleaner/healthier, Decreases stress, Other

Source: Acumen

Impact of the Pay-as-you-Cook™ service:

150 Households and businesses with a KopaGas PAYG LPG meter

98% of KopaGas customers are women

48% of households live below the USD 3.10 per person per day poverty line

96% of KopaGas customers are saving an average of USD 2.92 per week on cooking fuel

65% of customers are new to LPG cooking

86% of customers do all or most of their cooking with KopaGas

100% of customers are active every month

5 Average number of days between purchases in August 2017

1 Average number of days without gas per active customer in a month

2 to 3x higher cylinder turnover ratio than the industry standard in Tanzania

98% of respondents find KopaGas a very good or good value for money

63% of respondents reported that their quality of life had "very much improved" thanks to KopaGas

Sources: KopaGas, Acumen

Next steps

Recommendations

Based on the lessons of their successful pilot, KopaGas continues to improve the PAYG service by:

- Adding other mobile money operators to support customers who do not have a Vodacom SIM and would otherwise have to ask a service agent or family member to make a payment on their behalf;

- Improving M2M connectivity solutions to increase battery life and reduce costs;

- Simplifying the user interface and making it more intuitive;

- Addressing the needs of other market segments, including larger users such as self-employed food retailers; and

- Addressing the needs expressed by users after switching to LPG, especially the availability of stoves with multiple burners and the ability to use LPG for other preparation techniques (e.g. baking or grilling).

KopaGas continues to roll out the Pay-as-you-Cook™ service in Dar es Salaam. As part of its international strategy, it licensed its meter technology to Envirofit International to enter Ghana and Kenya under the brand SmartGas. Furthermore, as KopaGas makes extensive use of mobile tools in their operations to make distribution more efficient and manage cylinder inventory, they plan to offer a suite of mobile management tools to other gas distribution companies. They are also considering using M2M technology in their traditional gas distribution business as part of their scaling up strategy.

FOR MNOS

Provide off-the-shelf, one-stop-shop enterprise offers to utility service providers. KopaGas required several services from their operator partners, including M2M SIM cards, bulk SMS and mobile money integration. Having to negotiate custom commercial agreements with several departments slowed the pace of deployment considerably.

Continue to develop the mobile money ecosystem and partner with utility service providers. Having a thriving ecosystem and a variety of use cases for mobile money drives the digitisation of many types of expenditures traditionally made in cash, enabling mobile operators to increase their revenues. In August 2017, for instance, Vodacom earned transaction fees on 410 KopaGas mobile money payments. Cooking expenditures are as important as energy expenditures for the bulk of households in developing countries.[4]

FOR SERVICE PROVIDERS

Understand the trade-offs of M2M connectivity. KopaGas used M2M data to improve user experience and consumption of gas cylinders as well as its understanding of consumer behaviour. Thanks to M2M data, they were able to increase their productivity with higher cylinder turnover and customers did not have to incur travel costs to refill their cylinders. However, KopaGas also found that the type of M2M connectivity (SMS or mobile data) and frequency of information transmission had a negative impact on battery life and increased operational costs.

Use mobile technology for both product development and business processes. In addition to having mobile at the heart of the Pay-as-you-Cook™ service, KopaGas also makes extensive use of mobile tools in their operations, such as mobile apps for their drivers. This allows them to improve distribution efficiency and cylinder inventory management, and gain insight into agent performance.

4. The World Bank, June 2010, "Expenditure of low-income households on energy," http://siteresources.worldbank.org/EXTOGMC/Resources/336929-1266963339030/eifd16_expenditure.pdf; World Bank Group, AFREA, ESMAP, November 2014, "Clean and Improved Cooking in Sub-Saharan Africa," http://documents.worldbank.org/curated/en/164241468178757464/pdf/98664-REVISED-WP-P146621-PUBLIC-Box393185B.pdf; and BNEF, GOGLA, February 2016, "Off-grid solar market trends report 2016," http://documents.worldbank.org/curated/en/197271494913864880/pdf/115049-WP-PUBLIC-OffGridSolarTrendsReport2016.pdf

Appendix

Methodology

Monitoring and evaluation methodology and design was provided by Alexandra Tyers of Tyers Consulting.[5]

All data used in this case study is primary data, and data sources include:

- Operational monitoring data from December 2016 to August 2017, using data from the Inergy cloud platform, KopaGas' proprietary software used to provision, control and track mobile payments, meter logs, customer service, distribution and geolocation of assets and customers.

- A survey carried out by KopaGas in February and March 2017 with randomly selected members of the women's SACCO in the service area prior to the deployment of the PAYG LPG meters. This survey had a sample size of 48 respondents, all of whom belonged to the same SACCO.

- A phone survey conducted by Acumen in July 2017 with 52 respondents.

- An independent third-party qualitative evaluation in August 2017, conducted by Havis Research Company,[6] based in Kenya, and consisting of three focus group discussions with female users and three in-depth interviews with male users and the KopaGas sales and customer service agent. The study took place in Mwananyamala, Mwenge and Kinondoni in Dar es Salaam.

The research methods and data gathered are as robust as possible, but are not intended to be part of an exhaustive, academic study. Rather, we have taken a pragmatic approach to recording the impact of the mobile service on beneficiaries, capturing early-stage data and insights to help GSMA grantees improve their business performance, and generating knowledge for GSMA and the wider mobile ecosystem on the business case for using mobile innovations for energy, water, and sanitation services.

With this, we recognise some limitations of the data: capacity and budget restraints mean that most field data relies primarily on self-reported responses by users/beneficiaries; the sample sizes are statistically significant where possible, but statistical analysis has not been applied.

5. http://www.alexandratyers.com/
6. https://www.linkedin.com/in/havis-research-company-25444045/?ppe=1

For more information on the Mobile for
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