DFS use among digital Kenyans

Insights built on privacy

mastercard foundation

Partnership for FINANCE *in a* DIGITAL AFRICA

Caribou Data

About

About the partnership

The Mastercard Foundation Partnership for Finance in a Digital Africa (FiDA) aggregates and synthesizes knowledge, conducts research to address key gaps, and identifies implications for the diverse actors working in the digital finance space. In collaboration with our partners, FiDA strives to inform decisions with facts and accelerate meaningful financial inclusion for people across sub-Saharan Africa. Additional information and resources can be found at financedigitalafrica.org.

About Caribou Data

Caribou Data's unique privacy-preserving approach provides deep insights into the digital lives of consumers in emerging markets.

Using only anonymous data, we develop granular insights on app, network, content, and transactional behaviors, all structured and protected within our GDPR-compliant differential privacy layer.

The appendix contains further details on these methods.

Acknowledgements

The authors of this report are Bryan Pon, Jonathan Donner and Will Croft, based on research conducted by Caribou Data in Kenya.

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Notes

The views presented in this report are those of the authors and do not necessarily represent the views of the Mastercard Foundation or Caribou Digital.

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For questions or comments, please contact us at ideas@financedigitalafrica.org.

Introduction

In this section

We describe Caribou Data's research methodology, and introduce "digital Kenyans"—the target population from which we draw our sample of 1,000 individuals over three months.

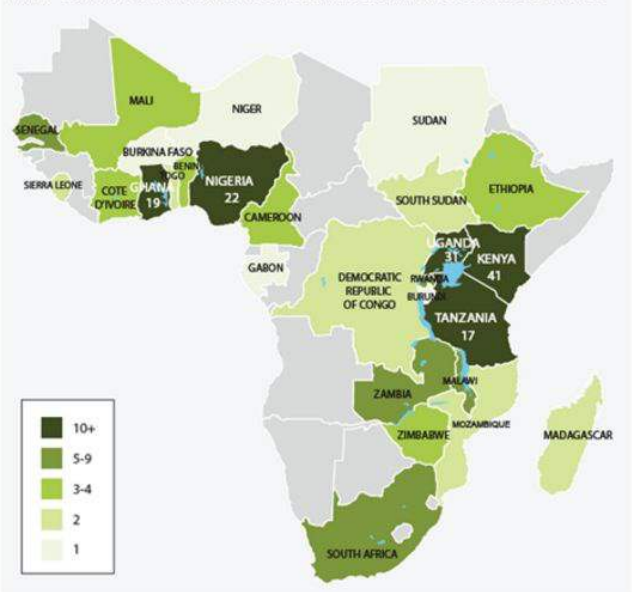
Exploring digital consumer behaviors in Kenya to provide new insights on how people engage with digital financial services

The digital financial services sector is seeing phenomenal innovation and growth worldwide. And the epicenter of it all arguably remains in Kenya, where deep penetration and early cultural acceptance of M-Pesa has led to a pioneering market for digital financial services. As both consumers and service providers become more sophisticated in their offerings, new innovations in instant credit, micro-insurance, and savings are taking root. Understanding Kenya, therefore, helps to understand the near future of DFS in similar markets worldwide.

Methods from Caribou Data deliver new forms of behavioral insights on the activity of digitally connected Kenyans, using anonymous, device-level data to see transactional activity in the context of the digital ecosystem.

Intended for practitioners, investors, and donors, these insights complement surveys and other self-reported research studies with actual behavioral data.

Distribution of applicants to CGAP funding program, showing dominance of Kenya



Source: [Figure] CGAP, 2017

Data directly from the device is more reliable and inherently contextual within the day-to-day experience of the individual

This research by Caribou Data provides a new perspective on understanding consumer behavior around digital financial services.

Unlike studies relying on self-reporting, this data comes directly from log files on the device, and as such represent actual behaviors captured in the context of an individual's day-to-day life.

Participants are paid a monthly stipend to anonymously share passive data from their device.

The resulting aggregate data shows patterns in how people use their devices for communications, entertainment, and financial transactions.

Caribou Data employs the highest standard in respectful treatment of data, including differential privacy techniques that ensure effective anonymity.

For example, data is anonymized and encrypted before leaving the device, and data queries are always aggregated—there are no individual records. See the appendix for full details.

Panelist apps can be installed on both Android smartphones and Symbian smart and feature phones

We draw our sample from the population of "Digital Kenyans," who represent the near-future slope of the adoption curve for DFS behaviors

Kenya boasts some of the highest rates of mobile, internet, and financial services usage in Sub-Saharan Africa. An estimated 78% of Kenyan adults own a phone, with a third of those a smartphone.[1]

We focus on what we call the "digital Kenyan" segment, defined as those adults who have a data-enabled device for connecting to digital services.

Our sample consists of 1,000 digital Kenyans, with 3 months of data from Q3 of 2017.

The digital Kenyan segment is not representative of the national population, and is skewed toward (though not exclusively comprised of) wealthier, urban, educated individuals, so we have to be careful in how we interpret the findings.

However, digital Kenyans represent the current and near-future slope of the adoption curve for DFS, and are therefore an important bellwether of behavior and responses to market activity.

Our 1,000-personal panel represents "Digital Kenyans"

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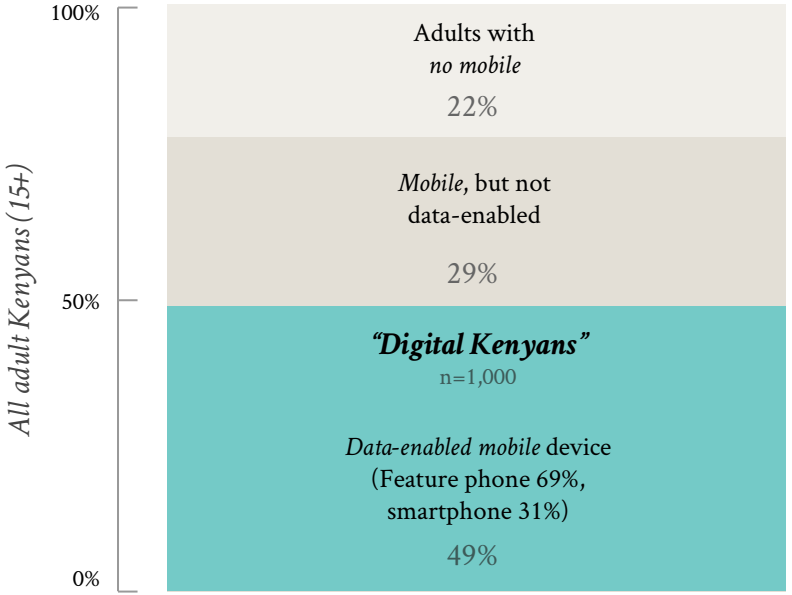


Sources: [1] Intermedia, Financial Inclusion Insights 2016; Communications Authority of Kenya; GSMA Intelligence (2016)

Panelists are recruited via face-to-face enrollment and online channels, and reflect the basic demographic splits shown by Kenyan census

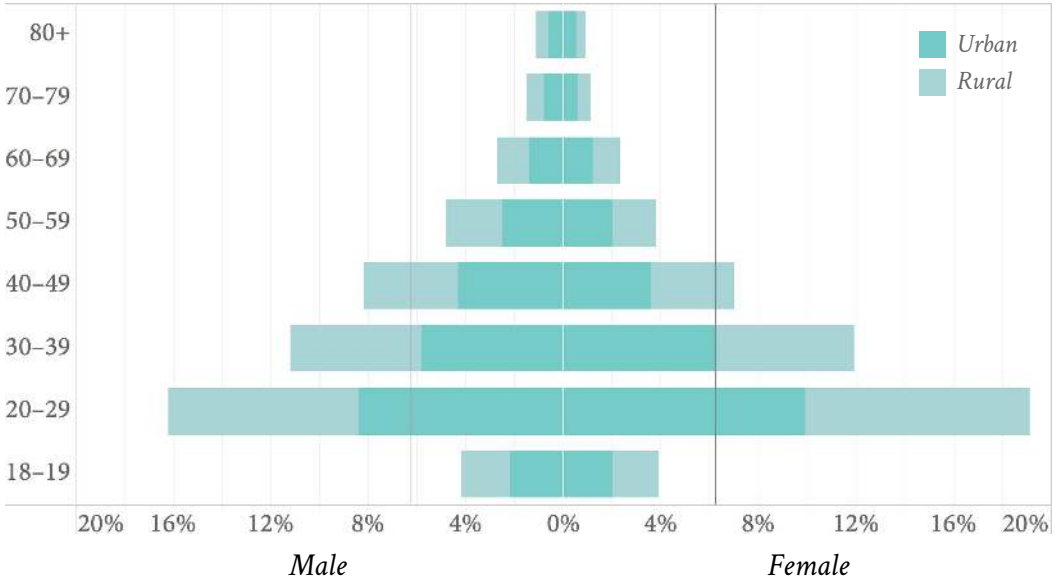
Since our app installs on Android or Symbian devices, our sample population of "Digital Kenyans" is comprised of Kenyan adults with a data-enabled mobile phone.

We recruited to match interlocking quotas for gender, age, and urban/rural locations, derived from the 2009 population census[1] and rebased for the 18+ adult population. The panel thus reflects the national population on these three dimensions: 51% female, 63% rural, and 67% under 40 years of age.

For the 2017 panel, we assume a linear relationship between the population distribution and phone ownership, and align these figures with industry estimates for mobile subscriber penetration (56%) and smartphone adoption (31%).[2]

Our panel of "*Digital Kenyans*" by age, gender and location

Q3 2017, n=1,000 Caribou Data • *insights built on privacy*



Sources: [1] Kenya National Bureau of Statistics, "Population and Housing Census, Volume 1C" (2009); [2] GSMA Intelligence (2016)

ii Kenyan digital lives

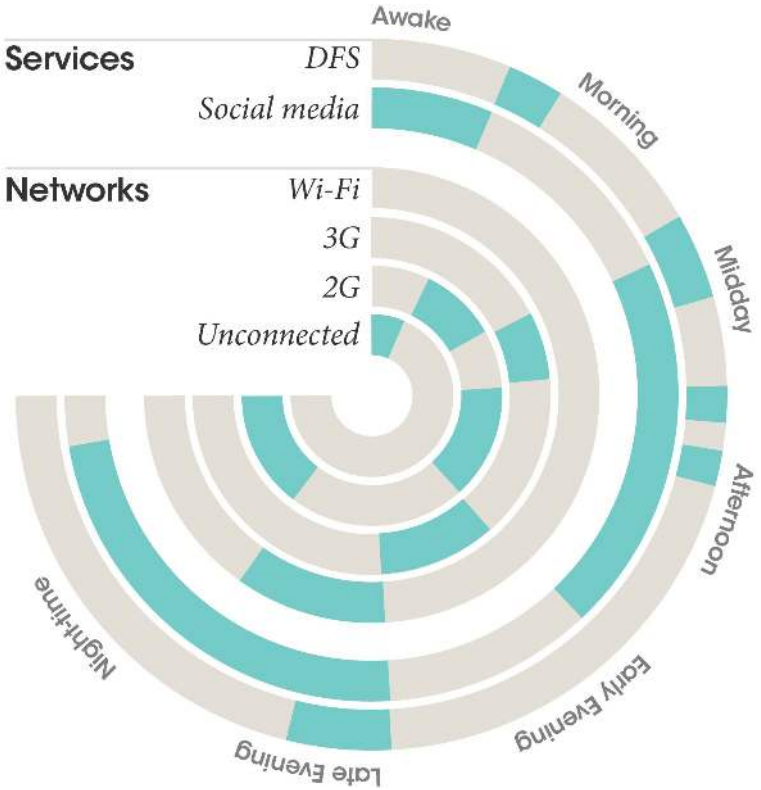
In this section

Context is everything. An understanding of how individuals use digital financial services requires an understanding of the broader digital environment in which people live.

Understanding "digital Kenyans" means going beyond adoption metrics to see the nuance and diversity in how regular people use digital devices and services in their day-to-day lives

Despite the high-level metrics on M-Pesa adoption and new digital products launching in the Kenyan market, there is tremendous diversity in how any given "user" engages with digital products and services on a daily basis.

As we found in our 2015 Digital Lives in Ghana, Kenya, and Uganda[1] study, users move in and out of coverage zones, have (and then spend down) airtime and data credits, switch between entertainment and livelihoods activities, and use their phones in many different ways, each day. DFS is only one thing that users do.



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Source: [1, Figure] Caribou Digital (2015) "Digital Lives in Kenya, Ghana, and Uganda"

Most smartphones in our sample are older/outdated, underpowered or nearly full—each of which is a detriment to the user experience

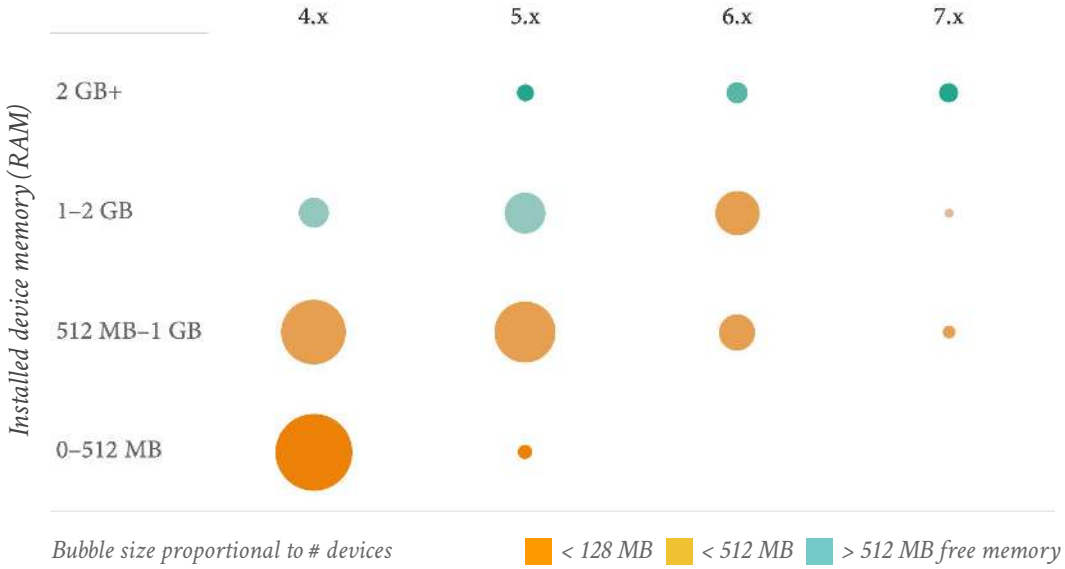
Although many reports focus on the share of smartphones vs other devices, in practice this distinction is less useful than it implies. Like smartphones, many feature phones have large screens, access the internet, and run apps.

At the same time, the most common specs for a smartphone in our sample were *barely* capable, and far from ideal: most run old Android OS versions, had low installed memory and/or little free memory to spare.

37% of Android devices in our 2017 panel ran on version 4.x or lower; globally, that figure is only 13% (as of July 2018)[1]; more than 25% of devices in our panel had less than 128 MB available—for reference, the standard Facebook app requires well over 100 MB alone to run.[2]

Share and capabilities of Android devices, by OS version

Q3 2017, n=314 (100% of Android smartphones) Caribou Data • *insights built on privacy*



Sources: [Figure] Caribou Data; [1] Android Developer Dashboard; [2] Uptodown blog, 2016

Urban users take advantage of 3G and Wi-Fi coverage, while rural users spend the majority of their time under slower 2G signals

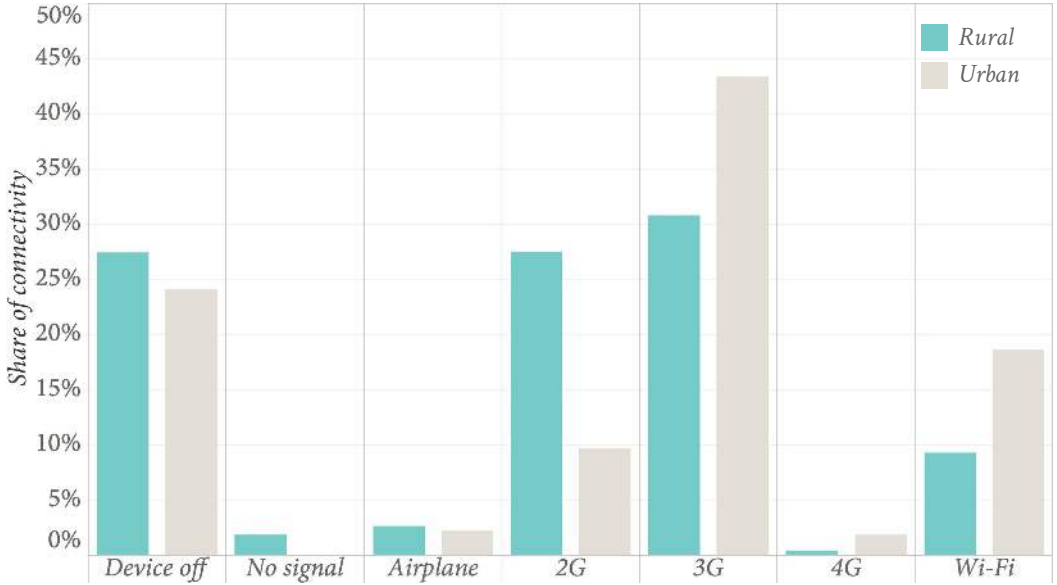
Although many Kenyans enjoy relatively robust network coverage, access to higher speed signals is not evenly distributed. About 30% of all time connected was spent on slower 2G networks, the vast majority of that by rural panelists, whereas urban users were predominantly on 3G or higher-speed connections.

The relatively high share of Wi-Fi use in urban areas is likely due to the growth in low-cost community Wi-Fi networks such as Poa Internet, which can offer a more affordable alternative to GSM for some users.

Finally, we can see the common practice of using "airplane" mode in order to force disconnect from all networks and thus prevent data consumption (especially background processes).

Time spent connected to each network modality

Q3 2017, n=1,000 Caribou Data • *insights built on privacy*



Source: Caribou Data

A “metered mindset,” plus uncertain income streams, lead many users to top up data in small amounts

Most users closely monitor their data consumption, displaying a “metered mindset”[1] about data consumption.

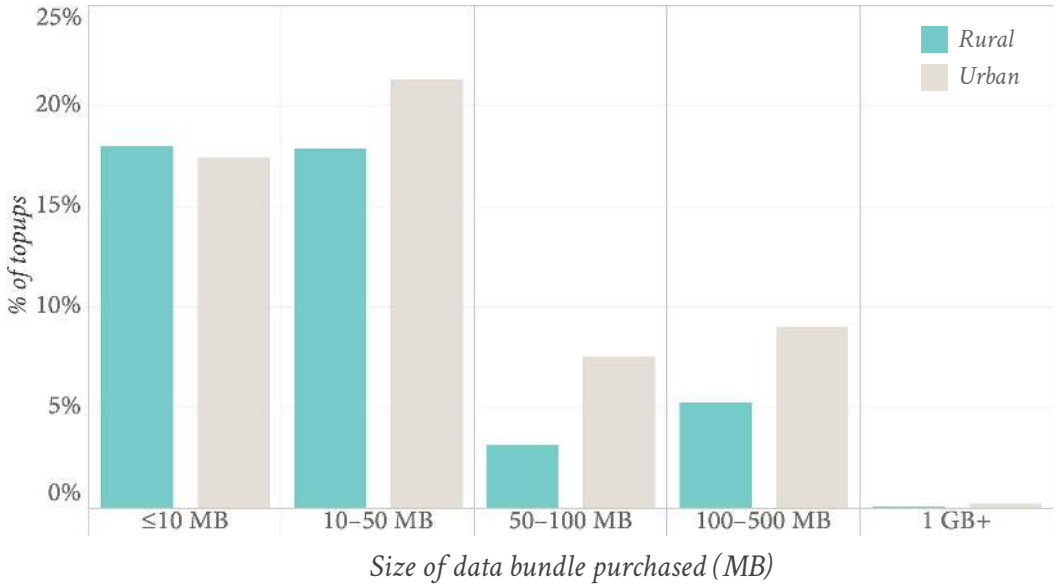
The vast majority of bundles purchased are quite small, <10MB or between 10 and 50 MB.

Bundles were smaller amongst rural users.

This form of interaction with the internet is more like “sipping and dipping” than “browsing or surfing,”[2] and limits discovery, reliability of contact, and deep engagement with digital resources.

Share of data bundles purchased

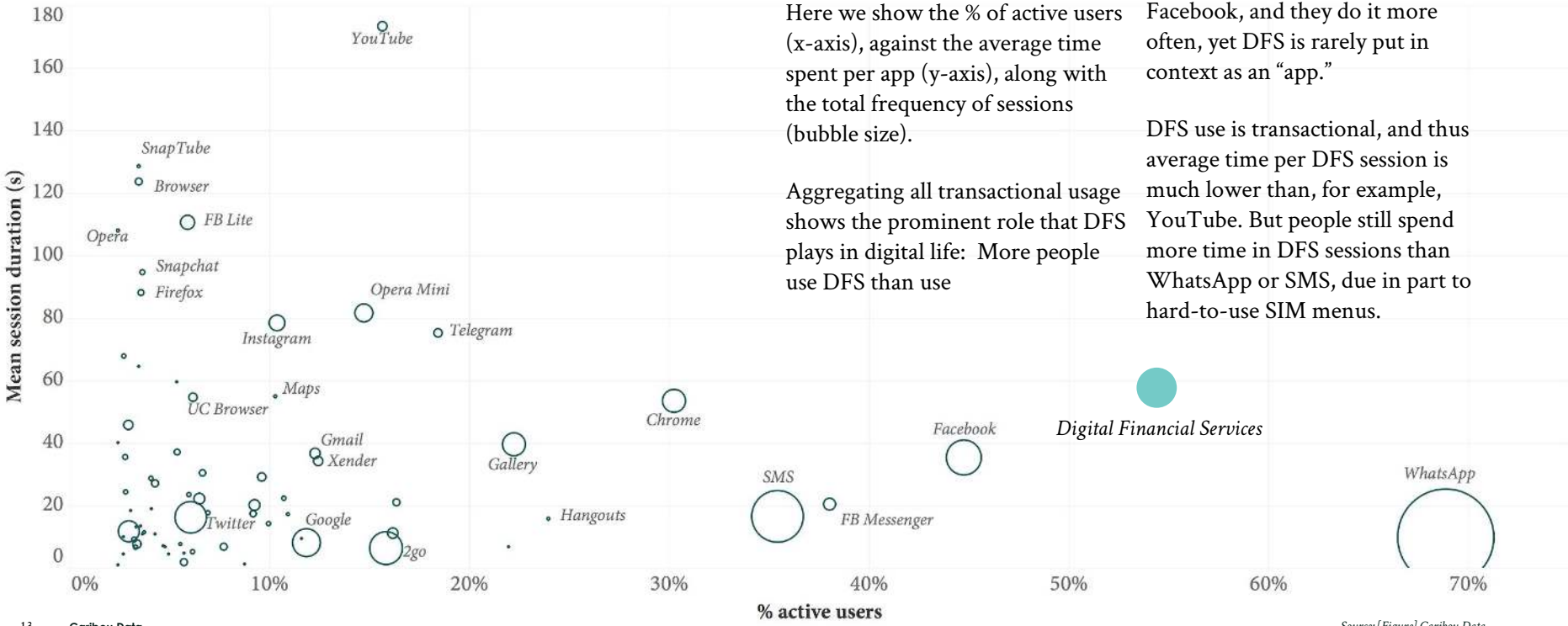
Q3 2017, n=1,000 Caribou Data • *insights built on privacy*



Sources: [Figure] Caribou Data; [1,2] Donner ‘After Access’ 2015

Thinking of financial transactions as an “app” reveals how prominent a role they play in digital life

Q3 2017, n=1,000 Caribou Data • *insights built on privacy*



Here we show the % of active users (x-axis), against the average time spent per app (y-axis), along with the total frequency of sessions (bubble size).

Aggregating all transactional usage shows the prominent role that DFS plays in digital life: More people use DFS than use Facebook, and they do it more often, yet DFS is rarely put in context as an “app.”

DFS use is transactional, and thus average time per DFS session is much lower than, for example, YouTube. But people still spend more time in DFS sessions than WhatsApp or SMS, due in part to hard-to-use SIM menus.

Source: [Figure] Caribou Data
Note: bubble size is proportional to # sessions (WhatsApp 415,000, YouTube 2,500)

Digital financial services use

In this section

We break down the big numbers to understand the detailed composition of the digital financial services sector in Kenya, exploring not only what digital services are being used, but also who is using them, and how these services fit within the broader context of people's digital activity.

Our data reaffirms and reflects existing observations: not everyone in Kenya is an active DFS user

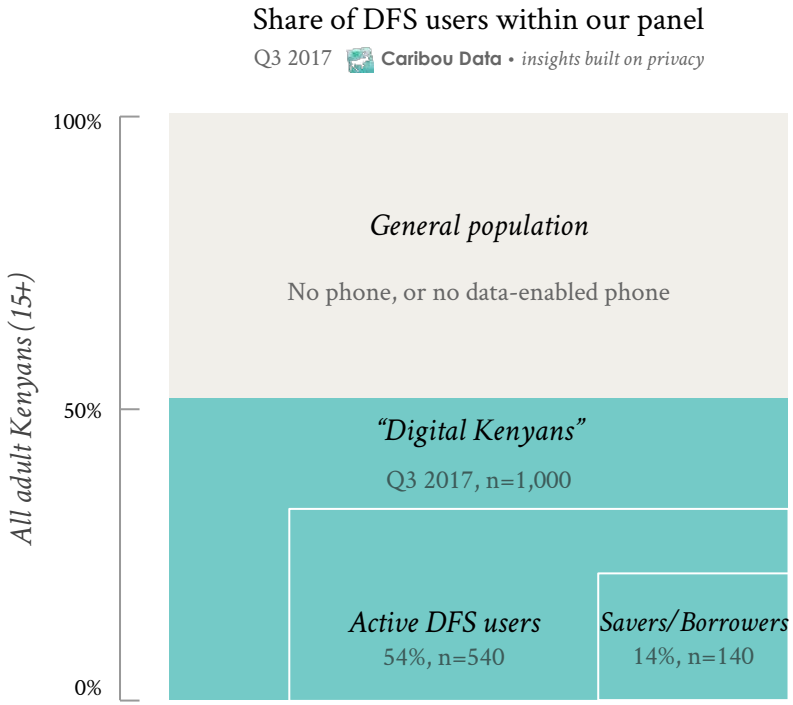
Going beyond simple adoption metrics reveals important patterns in DFS usage.

From our panel of 1,000 data-enabled phone users, only 54% recorded any DFS activity in the 90 days. Drilling down further, we find that only 14% of the panel engaged in either borrowing or saving activity.

This quick narrowing of the "funnel" is in line with other research: Intermedia found that while 67% of Kenyan adults had a registered mobile money account, only 60% of those were active on a 90-day basis.[1] FinAccess reported only 12% of Kenyans use DFS at least daily.[2]

In terms of loans, FSD Kenya estimates 27% of Kenyan adults have taken at least one digital loan, of which about 2/3 have had a loan within last 90-days.[3]

In general, DFS use skews towards urban users and patterns of early adoption.[4] This is is most pronounced in advanced services. For example, digital borrowers tend to be male (55%), urban (55%) and relatively highly educated.[5]



Sources: [1] Intermedia Financial Inclusion Insights, 2016; [2] FinAccess; [3,5] FSD Kenya; [4] FiDA Snapshot 4, 2017

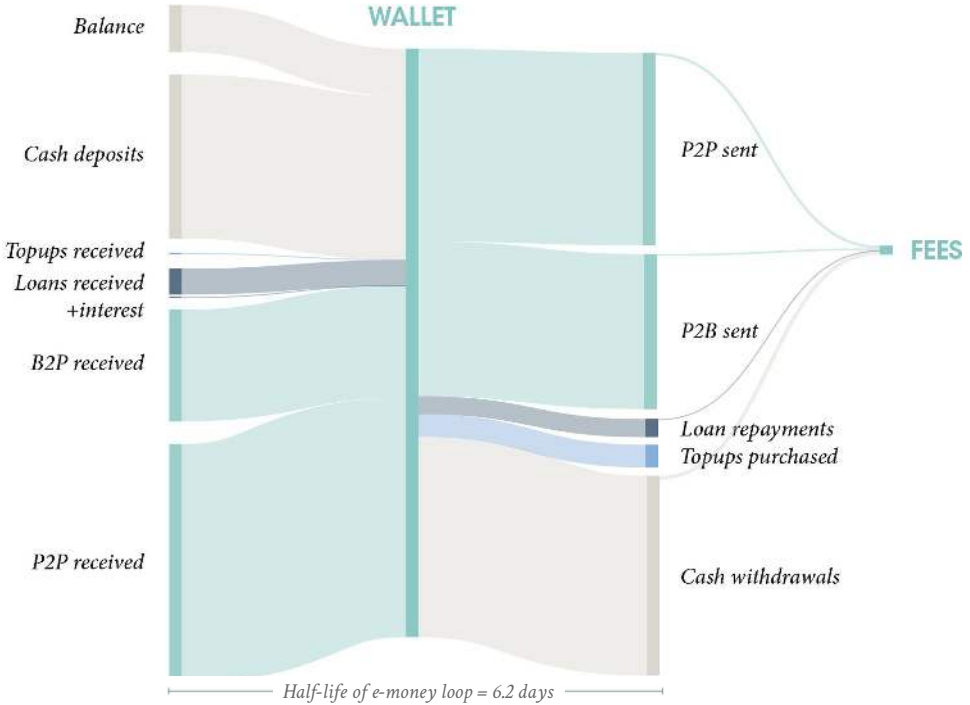
Cash flow dashboard: A complete accounting of value transfer in and out of the digital wallet

The chart offers an original analysis into aggregate value transfer into and out of users' digital wallets, providing a unique window into the relative share of value of each key DFS activity.

Inflows include "cash in" deposits, various transfers from other users, loan principal, and interest on savings.

Outflows include "cash out" withdrawals, various transfer to other users, airtime and data topups, interest and principal payments on loans, and other fees.

The relative shape of these flows help illustrate how some users "keep cash digital"[1] while others may be quicker churners.



Q3 2017, n=540 Caribou Data • *insights built on privacy*

Sources: [Figure] Caribou Data; [1] FiDA Partnership, Snapshot: 4 How can users begin to keep value digital, longer? 2017.

DFS products face challenges in changing behavior—even for smart-phone users, the SIM menu remains most popular interface for payments

This pattern—with mobile money users electing short codes instead of apps—is worthy of additional exploration by product designers.

Our initial impression is that this should be interpreted as evidence of the extent to which certain "DFS" behaviors have become a form of muscle memory, entwined into daily life.

These behaviors can (and will) change as new in-app functionality and integrations are deployed. But they will likely change more slowly than some might expect, even among users of "smart" phones.

Share of transactions by app vs SIM-based menu

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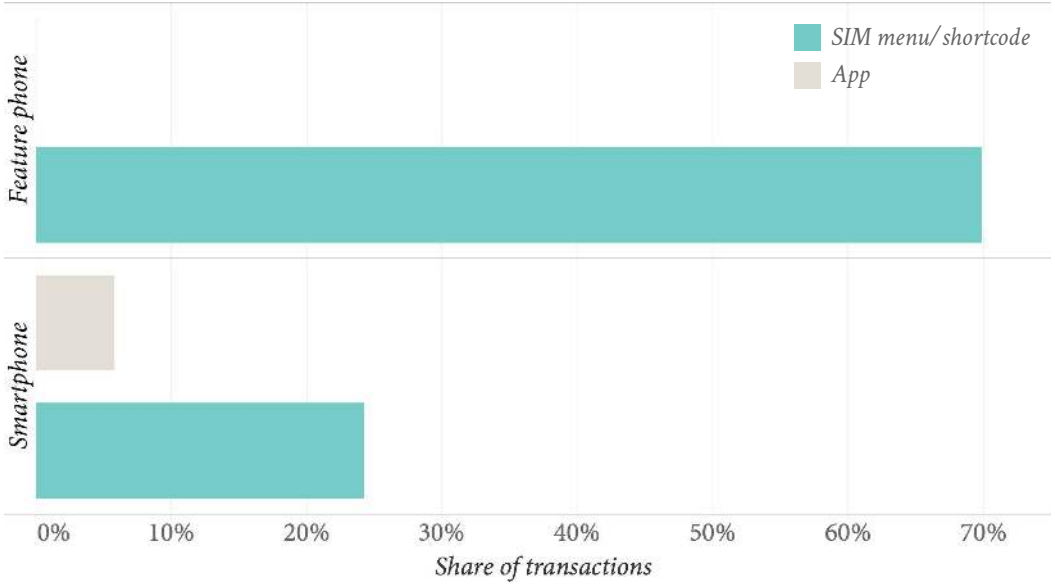
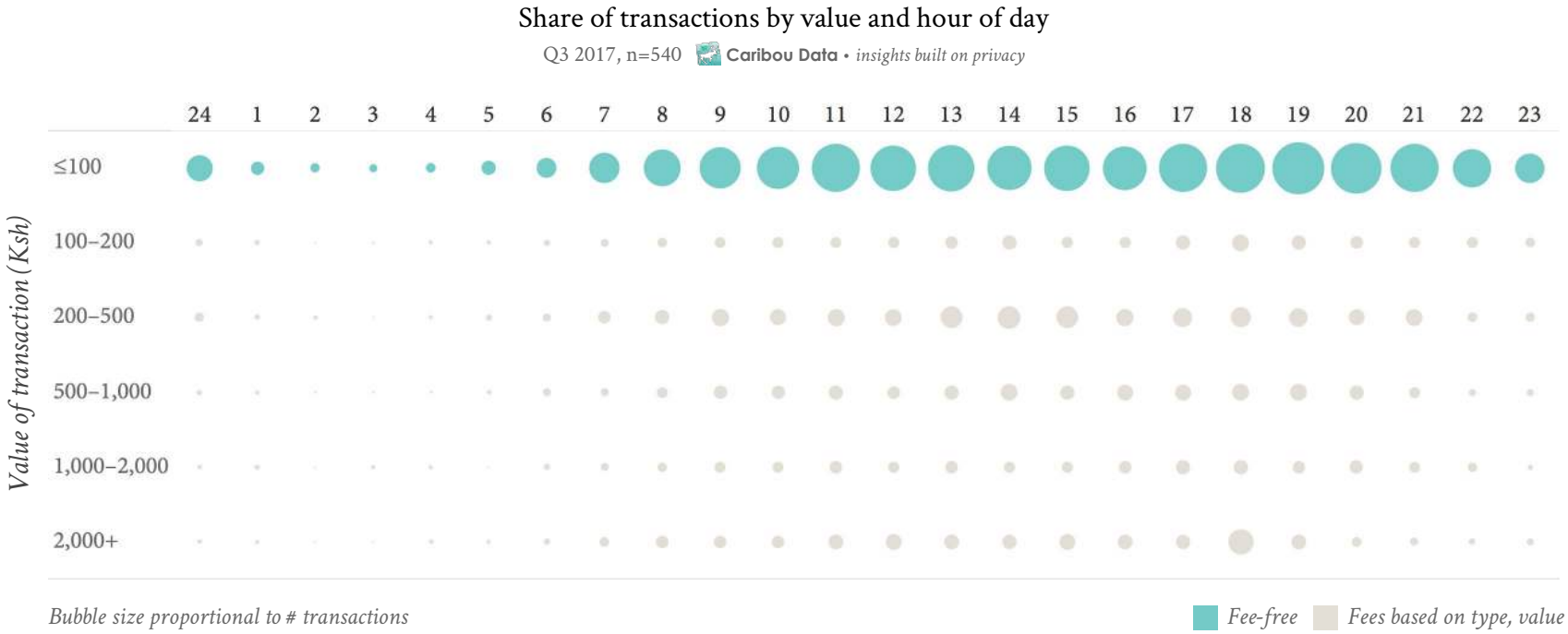


Source: Caribou Data

The peak of transactional activity is from 9am to 9pm, comprised primarily of low-value (67% ≤100 Ksh) transactions which incur no fee



Source: Caribou Data

Both the average frequency and value of financial activity is highest in the 30–39 age group

We suspect—although this could be tested further—that this reflects the intersection of two trends: that many young people aren't earning enough to have a major footprint, and that older people often are not heavy/daily users.

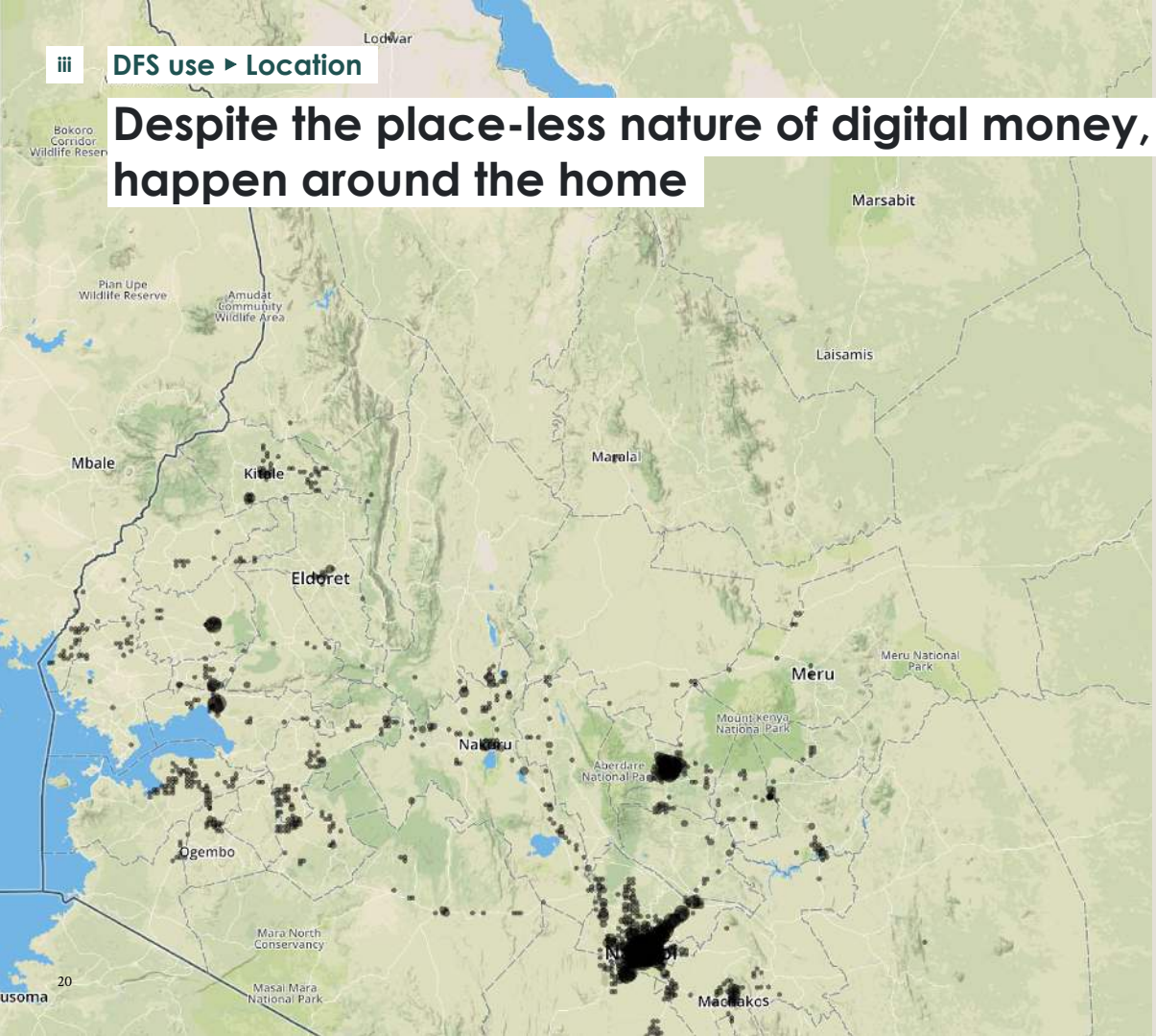
Therefore there appears to be a sweet spot for DFS volume/frequency amongst digital Kenyans which might be older than many would anticipate.

Distribution of transaction activity, by age

Q3 2017, n=540 Caribou Data • *insights built on privacy*

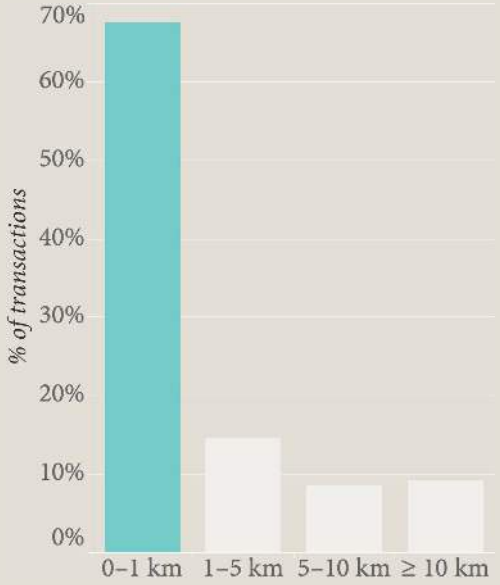
Source: Caribou Data

Despite the place-less nature of digital money, many transactions happen around the home



Transactions by distance from "home"

Q3 2017, n=540 Caribou Data • *insights built on privacy*



Source: [Figure] Caribou Data

iv Exploring advanced DFS use

In this section

An illustrative behavior-based “segmentation” focused on differentiating advanced DFS users from casual ones, and linking that to other behaviors and demographics.

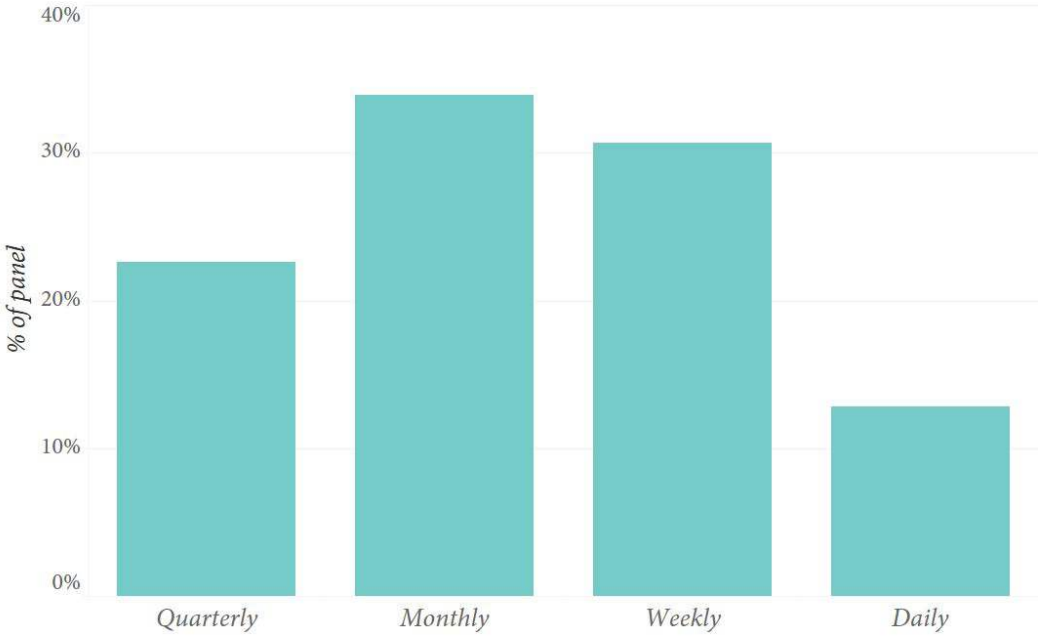
While 54% of our full panel were 90-day active DFS users, only 13% of those active users registered any kind of transaction on a daily basis

The metric of *"active users"*—typically defined in the mobile industry as having activity within the previous 90 days—hides significant variation in actual usage rates. Among our active users, the number of monthly transactions ranged from <1 to over 200.

Our overall rate of active users, at 54%, is roughly in line with other estimates, e.g., in its household survey Intermedia estimated that 40% of adults were 90-day active. Unlike our panel, that study included individuals without data-enabled devices, so we expect the active user rate to be lower.

Frequency of transactions

Q3 2017, n=540 Caribou Data • *insights built on privacy*

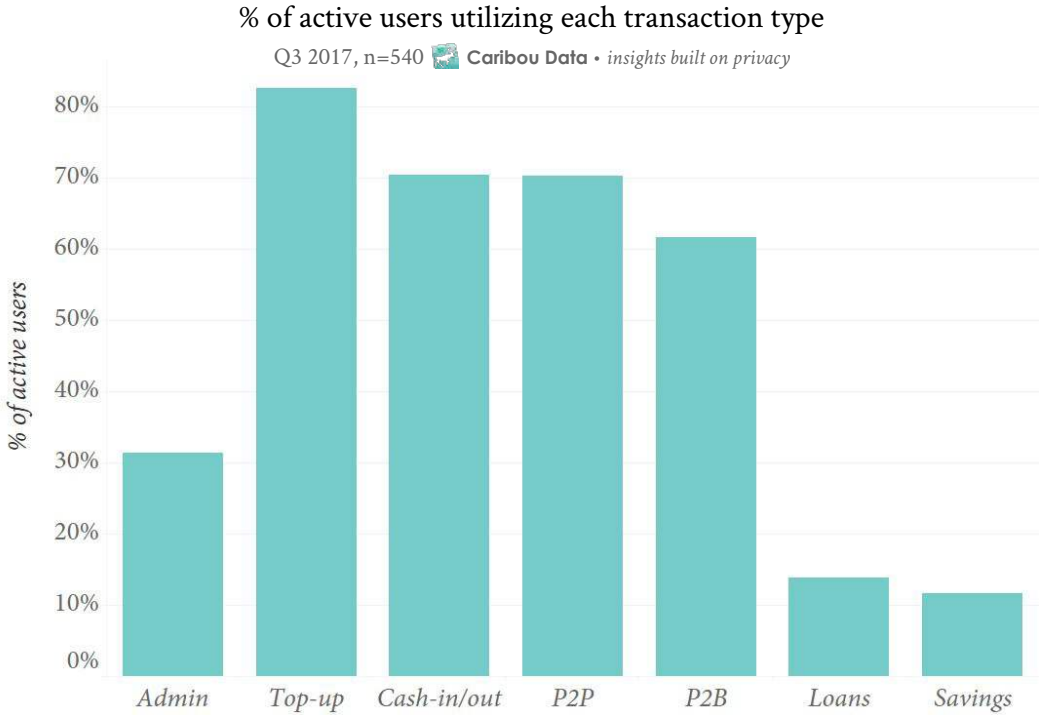


Source: [Figure] Caribou Data

Active users have very different transaction profiles. Top-ups, P2P, and cash-in/out are common, but savings and loans are much rarer

Traditional services continue to constitute the bulk of activity by active users, with more than two-thirds of users topping-up airtime and data, sending person-to-person (P2P) payments, and depositing and withdrawing cash.

Newer products and services do appear in the data. In the P2B category, which includes bill pay (e.g. utilities) and merchant payments (e.g., supermarkets), we see a number of new betting services and community Wi-Fi providers.



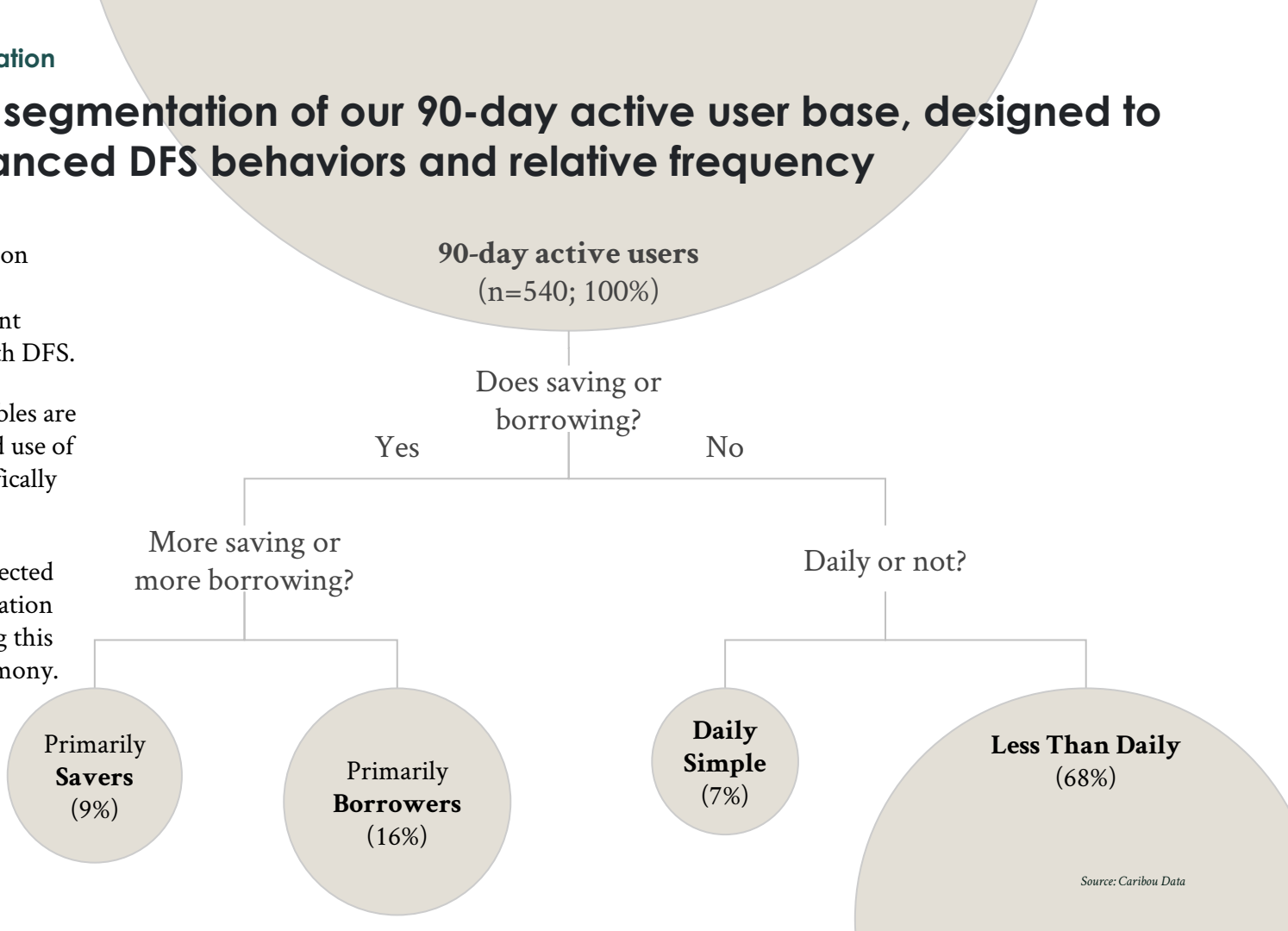
Source: [Figure] Caribou Data

A behavioral segmentation of our 90-day active user base, designed to contrast advanced DFS behaviors and relative frequency

We created a segmentation designed to identify use patterns amongst different levels of engagement with DFS.

Our primary input variables are frequency (intensity) and use of advanced services (specifically credit and savings).

For this analysis we inspected several possible segmentation solutions before selecting this one for clarity and parsimony.



Source: Caribou Data

Segmentation summary

Less Than Daily

Less than Daily users are likely the bulk of DFS users in Kenya in 2017-2018. They are the "default" by which other segments can be differentiated. They limit their DFS activities to airtime topup, cash in/cash out, P2P transfers, and an occasional P2B transfer. A higher proportion of their balances are cashed out, albeit slowly.

They use the least data, bought in the smallest increments, of any segment.

Daily Simple

Daily Simple users may be rare, but they are engaged! Skewing male, younger, and urban, we expect many of them are daily traders, integrating basic DFS into their livelihoods.

They pay 245 Ksh on average in mobile-money related fees each month, more than any other segment.

Proportionally, more of them gamble than in any other segment, which may contribute to the daily nature of their use.

Savers

Compared to other segments, *Savers* are more likely to be rural and to be female.

They top up in bigger increments and consume 10× the data of the *Less Than Daily* users.

They are good customers, on a fee basis. Some even over-provision for data, using less than they buy each month.

Borrowers

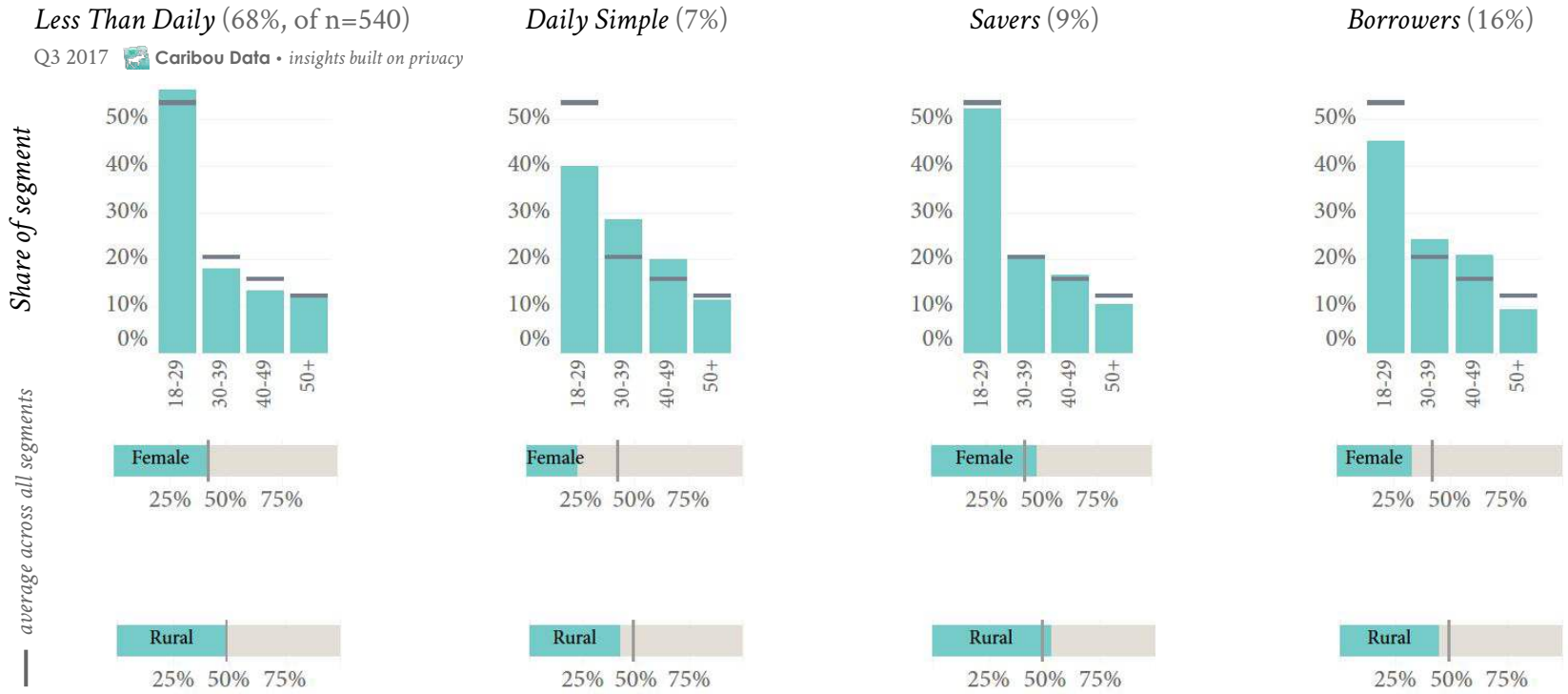
Borrowers are, perhaps, the most lucrative segment for MNOs, combining the high fees of the *Daily Simple* users and the high data consumption of the *Savers*.

Trending (but not all) male and urban, they are frequent, efficient money movers—topping up more frequently (in smaller values) than *Savers*.

More of them (nearly 40%) are on smartphones than any other segment.

Nearly half of this segment (47%) gambles.

Borrowers and *Savers* show demographic differences, with borrowing activity skewing older, male, and urban



Source: [Figure] Caribou Data

Don't look at smartphone adoption as the proxy for advanced DFS use—a higher number of transactions still originate on feature phones

No segment has left feature phones behind.

But *Borrowers* have the highest concentration of smartphone users. The opportunities to leverage smartphone capabilities to deliver credit will continue to rise.

Share of smartphones within each segment

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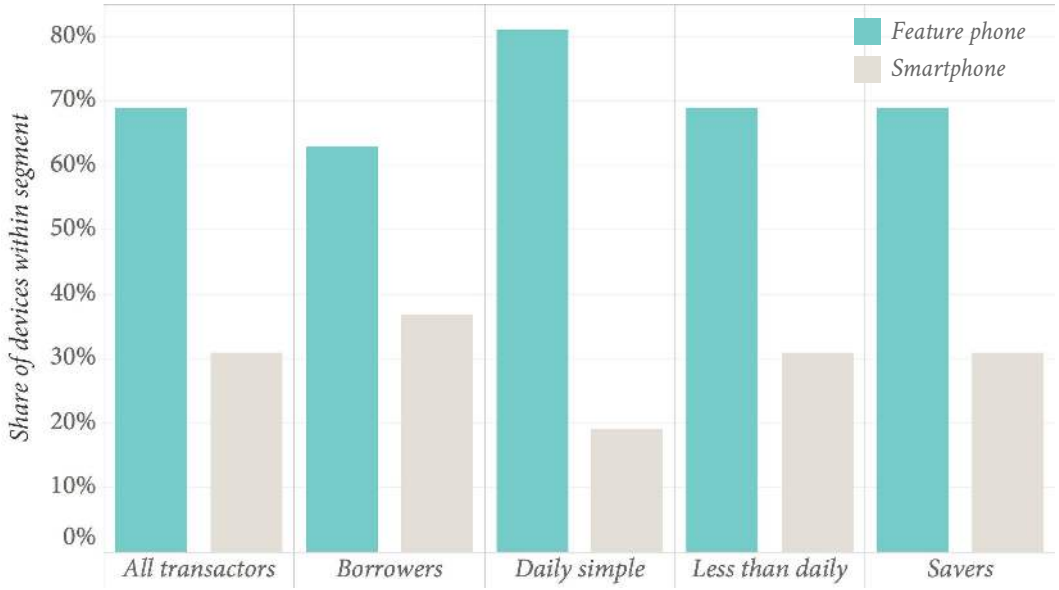

Source: [Figure] Caribou Data

Savers and *Borrowers* purchase larger data bundles upfront, while the average transactor opts for micro-topups

Savers consume the most data per month overall, while *Borrowers* make the most of the data they pay for, consuming the highest share of data purchased.

It is remarkable how much of the data purchased by our panel went unused. Unused data, like unused gift cards, is a notable source of revenue for MNOs. It's even more striking, though, that even savers might be over-purchasing relative to need. If so, they are paying more than they need to, per MB.

Data purchased, vs. data consumed

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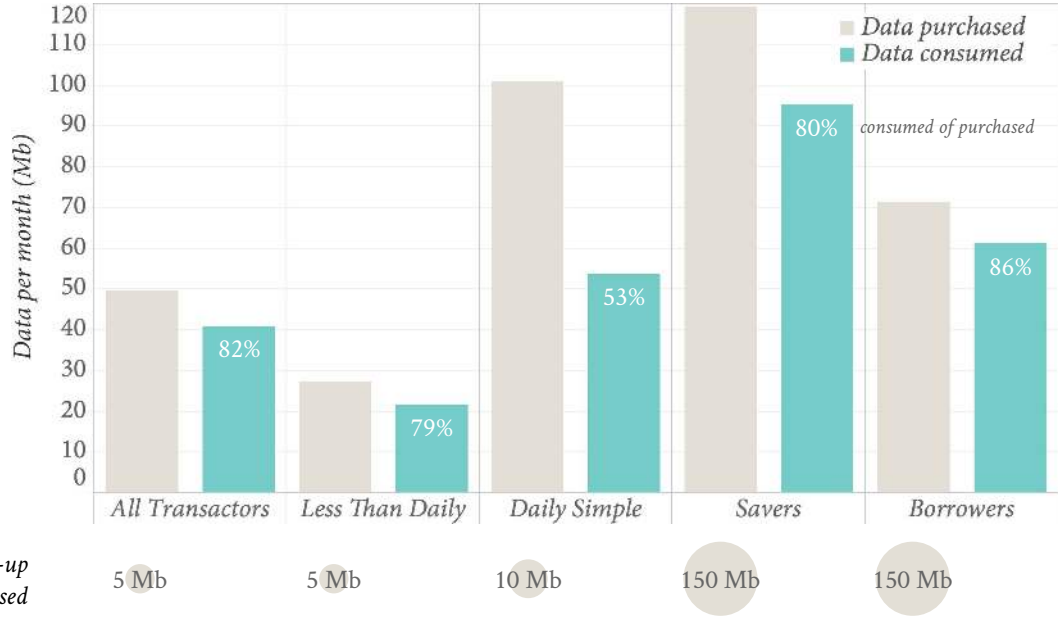


Source: [Figure] Caribou Data

Even if you turned off loans, borrowers would still be your best customers—"frequent users of everything"

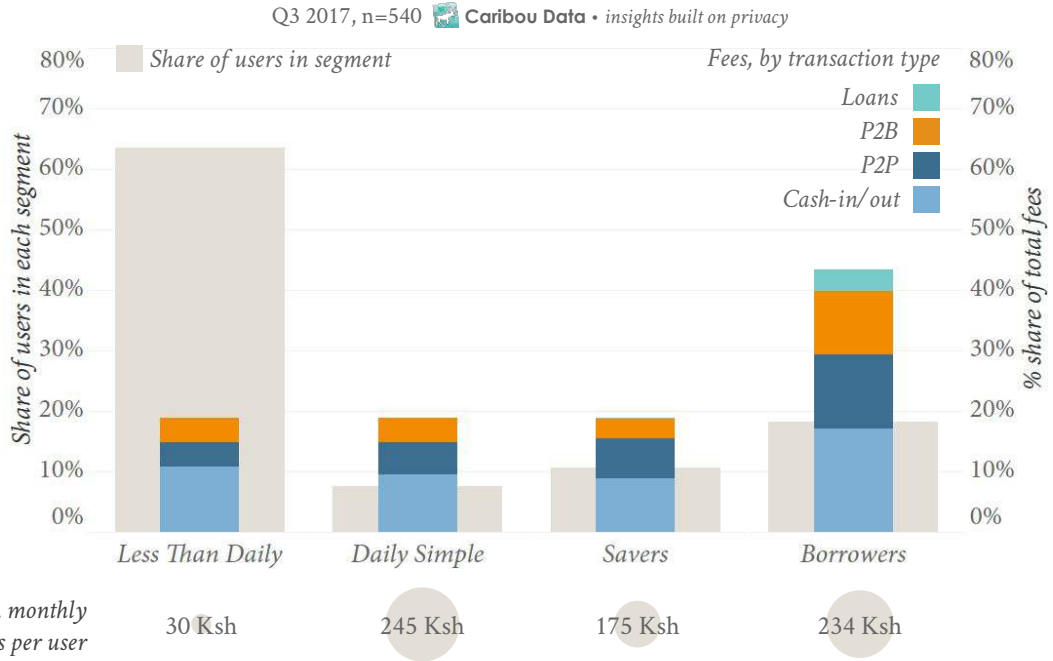
Not all users are equally valuable.

Our *Borrowers* segment comprises less than 20% of active users, yet as a segment contribute more than 40% of total fees. However, only a small portion of those fees are due to loans themselves. On a per-user basis, *Borrowers* pay 8× as much in monthly fees compared to *Less Than Daily* users.

On a per-user basis, *Daily Simple* users are also high-volume, generating an average of 245 Ksh per month in fees.

What proportion of the innovation in the space is going towards further activating the borrowing and high-use segments instead pulling in less frequent users and activating non users?

Share of total fees



Source: [Figure] Caribou Data

DFS transactions are “sandwiched” by automatic AND user driven messaging behaviors

What else happens on the phone “during” mobile money transactions?

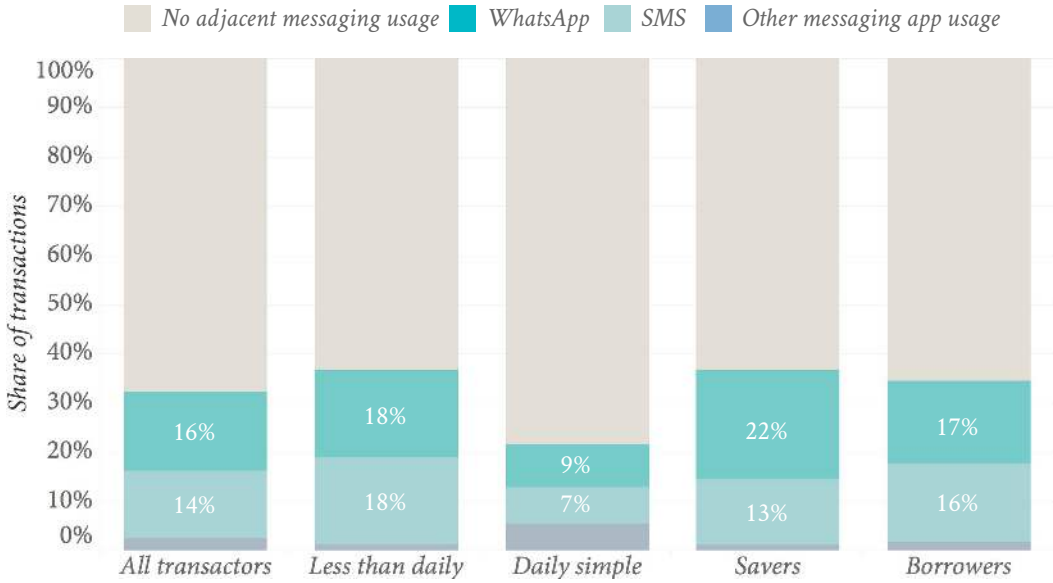
This figure captures adjacent SMS activity (within ±60 seconds) explained by the automatic delivery of transactional ‘receipts,’ often driving users to dismiss or ‘mark as read’ these messages.

But note how, across each segment, there is a similar or greater amount of WhatsApp activity immediately before or after mobile money transactions.

Daily Simple users are the most distinctive group here. Our hypothesis, though untested, is that more of their transactions are commercial, performed face-to-face.

Share of transactions preceded by, or following, messaging app usage

Q3 2017, n=540, adjacent= ±60 seconds Caribou Data • *insights built on privacy*



Source: [Figure] Caribou Data

Gambling is widespread, but the *Daily Simple* and *Borrowers* segments have higher ratios of gamblers, and more frequent gambling activity

Mobile sports gambling is widespread in Kenya,[1] although an accurate estimate of the proportion of Kenyans who gamble remains rare.

Amongst our sample, gambling is concentrated in the *Daily Simple* and *Borrowers* segments. Those segments represent 23% of active DFS users in our sample, but 75% of the bets, and 72% of the value wagered. These segments are the ones that are the most male and urban of the four.

Perhaps gambling can be seen as one of several modalities of interacting with DFS, as engagement becomes more frequent and more advanced. It is important to explore this in more detail.

Source: [Figure] Caribou Data; [1] Owuor 2018;

Which segment keeps cash digital?

Less Than Daily

68% of all DFS active users Caribou Data • *insights built on privacy*

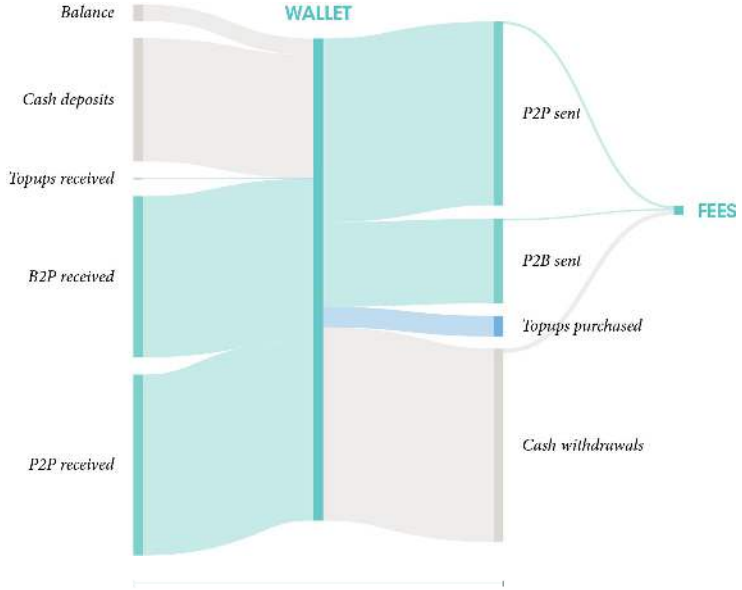
Half-life of e-money loop = 10.5 days

Here we show the visualised cash flow of an average user's wallet, for each of our segments. The height of the wallet in these figures is proportional across all four to the total value of all transactions passing through.

Daily Simple users move a lot of money though their wallets, relatively quickly. *Less Than Daily* users move just a little, more slowly, leading to a longer "half-life" of their stored value in the system.

Daily Simple

7% of all DFS active users Caribou Data • *insights built on privacy*



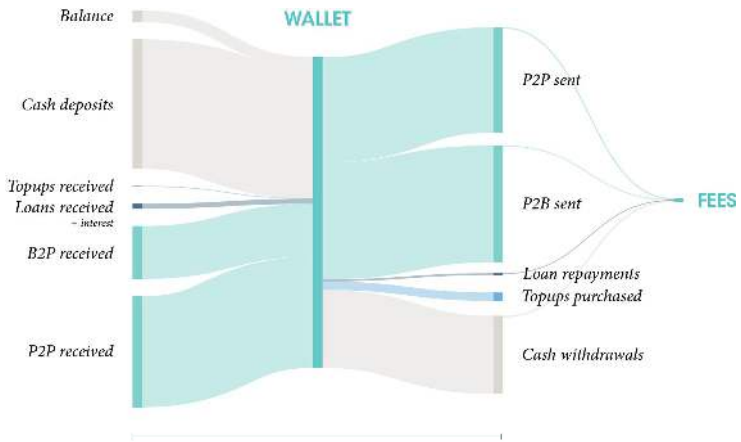
Half-life of e-money loop = 3.6 days

Source: [Figure] Caribou Data

Which segment keeps cash digital?

Savers

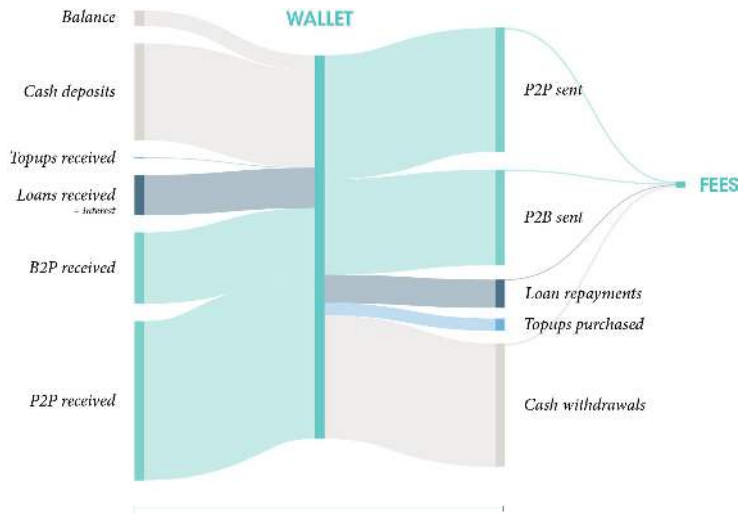
9% of all DFS active users Caribou Data • *insights built on privacy*



Half-life of e-money loop = 5.6 days

Borrowers

16% of all DFS active users Caribou Data • *insights built on privacy*



Half-life of e-money loop = 4.6 days

Savers and *Borrowers* have similar half-lives for cash in the system, with *Borrowers* moving more money through each month.

Source: [Figure] Caribou Data

Concluding remarks

In this section

We discuss implications and action steps for the DFS community.

What does inclusion look like?

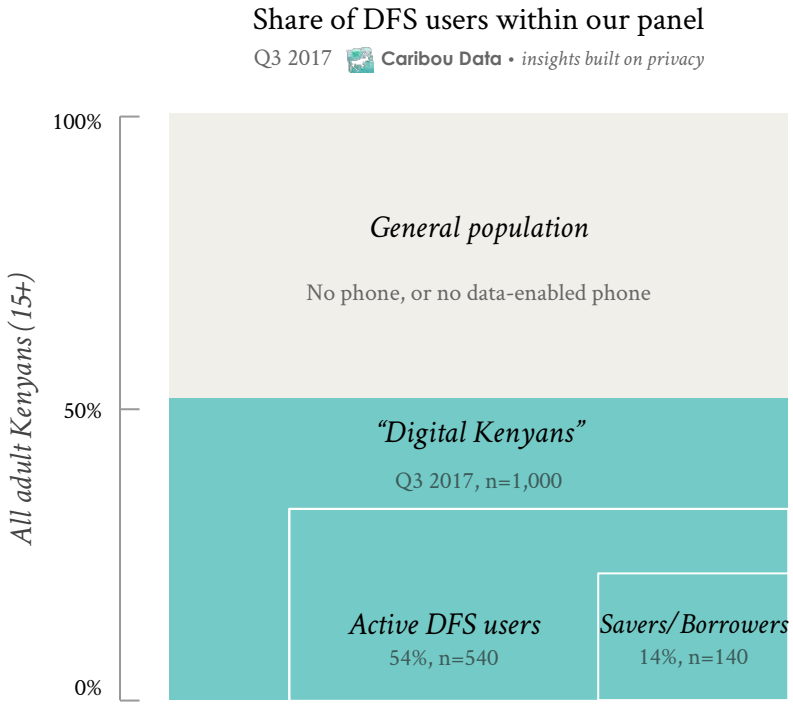
In the 2017 Learning Advances[1] report, we argued:

*To metrics such as "access", "affordability," and even "usefulness," we should add a focus on the extent to which individuals, households, and small enterprises actually and **effectively use** the technologies, products, and services to which they have increasing access.*

While the overall number of mobile money users in Africa may be impressive... most use DFS infrequently and only for very specific purposes (e.g., sending money to other people far away).

This analysis underscores how, even amongst "advanced" users in the saving and borrowing segments, there are indications of such challenges to effective use, notably overpaying for unused data, and gambling.

Each segment behaves differently, with implications for how users are on-boarded (the access challenge) and then begin to interact (effectively) with a changing DFS environment.



Source: [1] FiDA Learning Advances in Digital Finance 2017

How do these analyses shape our knowledge of inclusion and turn to action?

The unique perspective provided by Caribou Data has yielded a more nuanced and sophisticated way of examining financial behaviors.

The segmentation provides insights that can help a range of actors think more strategically about how to most effectively design and deliver digital financial services.

Insights gained begin to address some questions—and open the door to many others. It is our hope that these analyses and corresponding insights will serve as building blocks for future work in the space.

- Financial Institutions
- FinTechs
- MNOs
- Implementers

This segmentation (even if as an example), illustrates that there is more than one type of advanced user. Product development must be attuned to segmentation of users and corresponding needs. `

- Policy Makers

Policy needs to consider different user segments, emerging products and implications for how to best promote innovation while protecting consumers.

This behavioral segmentation of DFS use by "digital Kenyans" with data enabled phones offers insights, but also important questions:

Insights

Design for simplicity. Shortcodes still outpace in-app behaviors. There are still lots of feature phones, and amongst smartphone users, lots of underpowered, old, and "full" phones to contend with.

Less Than Daily users are a long tail, and majority of DFS users even in a leading market like Kenya. Work remains to encourage more regular use of DFS.

Kenya is still a place for small top-ups and a metered mindset.

There is more than one type of advanced user. Segmentations amongst advanced users are a helpful way to identify distinct needs/behaviors.

Intensity begets intensity—*Borrowers* in particular are deeply engaged with their phones and are high value customers.

Open questions

Do small-scale informal micro enterprises (likely many in the *Daily Simple* user base) need their own product offerings with a different fee structures?

What are the best ways to move Android users towards in-app behaviors?

How does DFS use interact with messaging use, beyond the proximites we observed in this analysis (ask your users, and explore links between messaging and DFS).

This behavioral segmentation of DFS use by "digital Kenyans" with data enabled phones offers insights, but also important questions:

Insights

There is plenty of room (and need) for digital Kenyans to move into more advanced and regular DFS use. Only about half of our sample was an active DFS user, and of that, the majority was still infrequent and simple.

Gambling is concentrated amongst heavy *Daily Simple* users and the *Borrowers* segment, an inbuilt, potential disadvantage to high-intensity use.

Savers (trending rural and female) and *Borrowers* (urban and male) are quite distinct, demographically. How might the outreach to each group be tailored to account for this fact?

Open questions

It might be worth exploring nudges and behavioral incentives for saving vs those for borrowing.

Looking at fee breakdowns by segment prompts a question: who is cross-subsidising who? *Borrowers* emerged as "frequent users of everything" which is good for service providers, but perhaps in a way that distracts innovation away from the long tail or occasional users.

This segmentation is designed to be illustrative rather than canonical, but the splits between *Savers* and *Borrowers*, and between *Less Than Daily* users and *Daily Simple* users may be worth exploring by the policy community in further detail.

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vi Appendices

In this section

We provide additional details about the methodology, recruitment and privacy considerations.

Methodological details and ethical considerations

Data

Data covers a 90-day period from Q3 2017, with a panel of 1,000 users. Data types collected include app usage, network connections including signal strength, approximate location, data consumption, and transactional records.

Sample

We recruited to match interlocking quotas for gender and age in urban/rural locations, derived from the 2009 Kenyan population census and rebased for the 18+ adult population.

The resulting panel thus correctly and proportionately reflects female (51%), rural (63%) and younger (67% <40) users

Panel recruitment

Our local recruitment partner in Kenya was Every1Mobile (E1M), which conducted a mix of online and in-person recruitment to fill the demographic quotas required.

A geographic distribution was not mandated, but our sample resulted in coverage of 45 of 47 Kenyan counties, as defined in the 2010 Constitution of Kenya.

Definitions

For all measures, time and durations are shown in seconds, currency data in Kenyan Shillings (Ksh) and data consumption in Mb. Any measures shown as an average use the *median* average.

A few common definitions:

- **Sessions**: number of unique app *events*, where a session is defined as the time between an app being foregrounded (typically ≈launched) and backgrounded (≈quit)
- **Active**: the observation of a behaviour at least once in a rolling 90 day period
- **Share**: as a proportion of the total panel

Methodological details and ethical considerations, cont.

Privacy

Our work is predicated on an absolute commitment to individual privacy, with a baseline of adherence to the GDPR,[1] regardless of whether local privacy law offers fewer protections.

Panelists are provided a clear explanation of how their data will be used, and the terms of the remuneration. Online explanations are in English only, but in-person recruiters are able to speak local languages as required.

We ensure effective anonymity of all panelists via processes taken at multiple layers: firstly, the data we collect is stripped of identifiable data before being recorded, and secondly, we utilise *differential privacy* techniques such as obfuscation, non-linear noise, and subsampling into some data types (such as location data), that may otherwise be more likely to be correlated or de-anonymized. All data is encrypted at rest and in transit.

At the analysis level, we employ similar differential techniques, which means that our system reviews every query and the result it would produce, and only returns a result if it is accepted to be non-identifiable; e.g., if a query was very specific and resulted in a very small *n*, the system would return a null result to protect against de-anonymization.

Limitations

Like all social science studies, this research has limitations. Most importantly, the sample is composed of data-enabled phone users, which by definition is not representative of all adult Kenyans.

Because we remunerate panelists (approximately $5/month in airtime) to participate, there is possible selection bias toward individuals who find that incentive attractive. In addition, the remuneration could impact some panelists' behavior in how much they spend on airtime/data. However, if anything we would under capture metered-mindset behaviors.

Despite in-person recruiters speaking local languages, it's possible that prospective panelists with limited or no English language proficiency were uncomfortable or unable to participate, introducing bias in the sample.

[1] European Union Regulation (EU) 2016/679, "General Data Protection Regulation" (GDPR), https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32016R0679&from=EN