

Analysis of mobile phone data can help increase subscribers' use of banking services, boosting their economic resilience

Big Data for Financial Inclusion

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SUMMARY

Access to financial services is essential to development efforts. Across Africa, financial inclusion remains below potential – partly due to the challenge for financial institutions in developing products for the low-income mass market. This project uses available data in an innovative way to help providers offer affordable financial services to previously unbanked people. By combining big data analytics and socio-economic research in Ghana, Uganda and Zambia, the team created a powerful tool to increase adoption and use of digital financial services (DFS). This enabled them to establish a statistical customer profile for an active DFS user. They then searched the big-data set to identify matching profiles among phone-service customers who are not yet DFS users, and mapped their locations. These are the customers most likely to become active users of DFS. This intelligence can be used for product development and targeted marketing campaigns to increase the supply of financial services to the previously unbanked. It also offers valuable insights for the World Bank's drive for full global financial inclusion by 2020. In Ghana, the use of project findings has already led to the financial inclusion of more than 70,000 people.

CHALLENGE

Across Africa, the coverage of formal financial services is poor, with low-income and rural customers largely excluded. Yet their need for affordable financial services is well documented. Financial inclusion increases resilience to economic shocks and helps grow small and medium-sized enterprises. The International Finance Corporation (IFC) is committed to helping create 600 million bank accounts in the developing world.

Through the Partnership for Financial Inclusion – a joint initiative with the MasterCard Foundation – the IFC is working to expand microfinance and advance digital financial services (DFS) in Sub-Saharan Africa. The growth of DFS offers huge potential to increase financial inclusion in developing countries, especially given the proliferation of mobile phone use. With high mobile phone penetration across the continent, many microfinance institutions, banks and mobile network operators (MNOs) are developing DFS. However, although many customers have registered for these services, only a minority use them regularly. Financial institutions also lack information about potential customers, which products address their needs and how to provide access to those products.

Big data offers the opportunity to mine existing information about mobile phone and DFS users to help MNOs and DFS providers to deliver products and services to previously excluded customers. Using a company's DFS transactions database and call detail records, the project team sought to characterize active mobile DFS users and understand what drives inactivity.

They hoped to identify behavior patterns among customers and use that information to stimulate better use of DFS and identify potential new users.

The study has already led to the financial inclusion of over 70,000 people

INNOVATION

The project used big data from MNOs and financial institutions in Ghana, Uganda and Zambia to calculate profiles for users of mobile financial services. Using statistical predictors derived from the usage patterns of the current active network user base, the team firstly identified which MNO customers are highly likely to become active DFS users. As mobile phone data does not contain socio-economic or demographic information, they also designed classic surveys to achieve more complete profiling of users and non-users of financial services. Potential users can then be targeted by marketing campaigns.

Big data analysis

The study started with a big data analysis of call detail records (CDRs) covering one MNO per market, each with an average of 4 million mobile subscribers. Six months' of CDRs and DFS transaction records, nearly two terabytes in size, were extracted from the MNOs' servers. The team segmented users into three categories:

- Voice only
- Registered but inactive DFS users
- Active DFS users.

These segments showed very distinct patterns of voice calls, social network structures and geographical mobility. Active DFS users make on average almost twice as many phone calls as non-users. These calls also last significantly longer. They also send and receive the most text messages and have a much larger social network. They are therefore the high-value customers and early adopters each MNO seeks to attract.

The research found that many telecoms-only customers had a demographic profile similar to

these highly active DFS users, indicating a strong correlation between high users of telecoms services and the potential to be an active DFS user. The team therefore scored all telecoms subscribers according to the extent to which users are similar to the profile of highly active DFS users. Using machine learning techniques, they modeled the 15 most powerful variables (such as the number and length of calls or number of call contacts) which predict whether a subscriber is likely to become a DFS user. Based on the findings, the team compiled maps showing the actual distribution of DFS users, the distribution of predicted adopters, and districts with highest concentrations of likely adopters.

Classic socio-economic profiling interviews

To strengthen the profiles of different types of DFS customer, the team also carried out a socio-economic study in Ghana:

- **Demographic profile**

Based on the average three-monthly volume of voice, text and data usage, network subscribers were organized into high, mid and low users. A random selection of 500 from each segment was interviewed by phone. The results indicated that mobile phone users are 61 percent male and relatively young (45 percent under 35), with good literacy and access to financial services (66 percent have a bank account). There is an apparent gender effect at all three levels of mobile activity: Women

switch less between providers and have lower mobile activity levels on the network they use. This suggests opportunity for MNOs that develop marketing strategies targeting women.

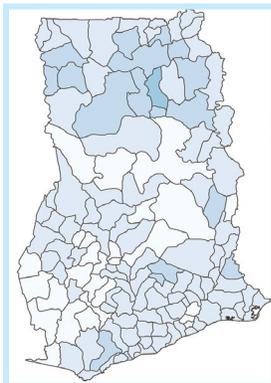
- **Use of Digital Financial Services**

Ninety-five percent of NMO subscribers, including users over 55, are aware of DFS. However, there is a gap between awareness and usage, especially among low-activity subscribers. There is also great disparity between male and female subscribers, with low-active male network users having the same level of DFS usage as high-active female network users. The gap between awareness and usage decreases the younger the users are. The key reason why so many NMO subscribers are not using DFS is around understanding and products. Twenty-eight percent of non-users declared they have no need for DFS, which suggests they need explanations of how DFS can help their financial management. MNOs should also consider whether they have the right products for these customers. Twenty-three percent of customers reported having no money to use with DFS, reinforcing the need for customer education, as even with irregular incomes, many could still benefit from DFS.

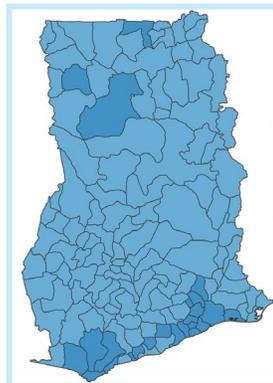
RESULTS

In this study, big data was used to discover the profile of those MNO voice customers most

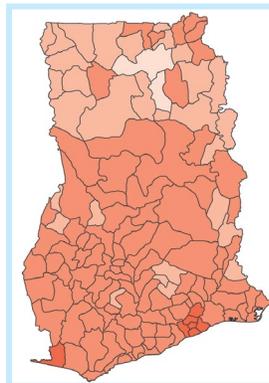
District-level adoption rate



Predicted adoption rate



Top target districts



Through big data analysis, the team mapped the distribution of current, predicted and likely users of digital financial services in Ghana

likely to become regular DFS users. Research then identified socio-economic groups that fit these profiles but were not using DFS. It is reasonable to expect that a combination of targeted marketing and the provision of DFS relevant to these profiles should result in significantly increased active usage of DFS.

Comparing the findings from the socio-economic survey with big data analysis, the team found that infrequent users of voice calls are also more likely never to have used DFS. While younger people are the most active users of voice, they also have the largest share of registered yet inactive DFS accounts. This suggests improvements needed in DFS products, as mobile-savvy younger customers are ignoring them despite using their phones regularly. An important finding was that DFS users display increased network usage and loyalty to an MNO than non-DSF users. The socio-economic research showed high potential for growth, given that nearly half of voice subscribers have never used DFS. In particular, the youth segment and infrequent female voice users are high potential target groups who could be approached with tailored products and communication strategies. Appealing to these consumers could lead to increased use of DFS and ultimately to greater financial inclusion. Findings from big data analysis are already helping MNOs promote both the use of DFS and their telecoms business. In Ghana, use of information from this study has so far led to the financial inclusion of more than 70,000 additional people. The MNO in Ghana called the list of potential customers directly to promote DFS. These calls were far more effective than previous indiscriminate efforts to attract customers.

The team now hopes to develop more sophisticated metrics of phone use, such as

social network structure, behavioral traits, geographic segmentation and mobility analysis. Statistical analysis could also identify key traits that differentiate groups, such as voice versus DSF users or active versus inactive DSF users. Ultimately the researchers aim to construct a model to compute the likelihood that each voice subscriber will sign up for DFS or become an active user.

LESSONS LEARNED

The combination of big data analysis and classic research methods offers valuable lessons in getting the most from big data:

- ***Enhance big data analysis with traditional research techniques***
Despite the current hype, big data is ultimately 'only' a new (albeit very rich) data source, and it does not make other data obsolete. Talking to people remains a powerful source of information. For example, big data analysis offers huge potential to support financial inclusion, but only by enhancing it with consumer profile research it is possible to target customers with precision.
- ***Plan for imperfect data***
It's rare to have perfectly extractable data. There may be gaps or reliability issues, especially if data sources span different machines or archives. Different data (such as call details and DSF transactions) usually sit on different servers, which can complicate and prolong data extraction. Before starting the full extraction, request samples of data from all sources, to ensure they can be unified without problems. Even with the best preparation, extraction often takes longer than anticipated, so include potential delays in project planning.