The Partnership For Financial Inclusion

Find The Gap
Can Big Data help to increase
Digital Financial Services adoption?

FIELD NOTES #4

Big Data is a big topic. Rarely a day passes without news of innovative applications of the data we all produce through our frequent use of technology. It is also increasingly recognized that effective analysis of data can support efforts promoting development. The Partnership for Financial Inclusion, a joint initiative of IFC and The MasterCard Foundation to expand microfinance and advance digital financial services in Sub-Saharan Africa, is working with private financial sector clients on how to employ Big Data to promote financial inclusion. We explore how a combination of big data analytics and socio-economic research can provide a powerful tool to increase adoption and usage of digital financial services (DFS). In this issue of Field Notes we share some of our findings from projects in Ghana, Uganda and Zambia.

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The MasterCard Foundation

IFC
International Finance Corporation
WORLD BANK GROUP

Background

IFC is committed to help create 600 million bank accounts in the developing world as part of the World Bank Group's goal to bring global Universal Financial Access by 2020. A significant number of these accounts are likely to be in Sub-Saharan Africa, home to a majority of the 25 focus countries for the initiative. IFC's Financial Institutions Group works with microfinance institutions, banks and mobile network operators across the continent to support this effort, both with investment and advisory services. With 130 live deployments in 38 markets, including mobile money pioneers such as Kenya's M-PESA, Sub-Saharan Africa is at the leading edge of the digital financial services evolution in developing countries. Increasingly, IFC is leveraging its expanding network of digital financial services providers to catalyze innovative, low-cost approaches to expand financial services to previously unbanked people.

In this rapidly developing market, data analytics holds a lot of promise. It can produce necessary business intelligence for service providers to fine-tune product development, sharpen marketing efforts, and improve strategy to better reach the unbanked.

Most markets in Sub-Saharan Africa share some common traits. The coverage of formal financial services is generally low, and low-income and rural customers tend to be largely excluded. In addition, although mobile phone penetration is often high, network coverage can often be a challenge in practice. Many microfinance institutions, banks and mobile network operators are engaged in the development and deployment of digital financial services, although the extent and impact varies by market, often depending on local regulation. DFS providers in most markets, however, face the challenge that although many customers have registered for these services only a minority use them regularly. A number of IFC's projects are therefore focused on increasing usage of these digital financial services. The Big Data work undertaken under the Partnership for Financial Inclusion advances providers' understanding of existing and potential customers, and thereby helps to better drive uptake. Using a company's mobile money transactions database and call detail records, we seek to answer questions such as what characterizes active mobile money users? What drives inactivity? Is it possible to identify behavior patterns among customers and to use that information to stimulate better uptake of the service? And of particular importance, can we better target potential new customers that are more likely to be active DFS users?

The goal of the Big Data projects referenced in this study was to identify which MNO customers are highly likely to become active mobile money users, using quantifiable statistical predictors derived from the user patterns of the current active user base. In each project, six months of transactional data, nearly 2 terabytes in size, was extracted, merged and examined.

Using mobile phone data is often touted as the panacea to learn everything about consumers, but it is often forgotten that these data do not contain any socio-economic or demographic information. To overcome this limitation, IFC designed a study combining Big Data and classic surveys in order to achieve a more complete customer profiling of users and non-users of financial services. The results highlight that distinctive differences are manifest between various user segments regarding gender, age, mobile call and mobile money usage.

Call detail record analysis (big-data analysis)

This study started with a Big Data analysis of call detail records (CDR)[1] covering one MNO per market, each with an average of 4 million mobile subscribers. Six months of CDRs and mobile money transaction records were extracted from the servers of the MNOs. Users were then segmented into "Voice only", "Registered (but inactive) Mobile Money" and "Active[2] Mobile Money" users. The results show that these segments have very distinctive patterns of voice calls, social network structures and geographical mobility.

Example Provider *Per 6 Months*	Voice	DFS Registered	Active DFS Users
Total Calls Made	734.4	995.9	1244
Days with Data Activity	20.38	36.4	46.33
Number of Cell Towers Used	51.47	64.21	457.9
Geographic Size of Incoming Network (km)	56.23	78.68	103.5
Geographic Size of Outgoing Network (km)	12.12	15.65	20.01
Days with SMS Activity	42.34	63.64	79.99
Size of SMS Network (km)	10.64	20.6	29.85
Days between Voucher Reload	6.34	7.11	6.26

Active DFS users, i.e. customers who use digital financial services consistently at least once per month over six months, make on average not only almost twice as many phone calls than customers not using mobile money, but these calls also last significantly longer. The same pattern holds regarding text messages: active mobile money users send and receive the most SMS, followed by inactive customers, and then by non-users of DFS. Whilst active DFS users call and text their friends, families and business partners more often, they

also have a much larger social network with around 130 contacts compared to about 60-70 for other customers, and these contacts are geographically more spread out. In one market, for instance, the radius of the social network is 170km larger. By contrast, non-users of DFS seem to move around much less than active users as evidenced by a lower number of cell towers picking up their phone signal. In one market, active users seem to move around 10 times more than normal users. There may be other factors in play such as lifestyle and mobility differences between rural versus urban areas, but overall, DFS active users appear to leave their local areas far more.

Active DFS users are heavy users of all telecom services and are thus the High Value Customers and early adopters each MNO seeks to attract and retain. This reinforces the importance of DFS to the MNOs. In order to attract and retain the most lucrative customers, MNOs need to provide a good quality mobile money service. While more research is needed to better understand

Figure 1 (left to right): Current, predicted and top districts of Mobile Money users in a province of a market surveyed

these customers and determine whether regular usage of mobile money increases usage of other services, it is clear that we are dealing with a specific and valuable customer segment that is geographically mobile and socially well connected. For example, it is possible that some customers have small businesses for which they use their DFS accounts, which could explain both their high number of contacts and their mobility. The fact that DFS users can afford higher bills for all mobile services might indicate that they are better off than average MNO customers. This hypothesis is supported by the findings of the World Bank poverty scoring tool (SWIFT) that showed the poverty rate of one MNO's clients in Ghana to be lower than the national average at 18%, while the rate for mobile phone owners[3] is 21% and the overall poverty rate is 24.4 percent. Unfortunately, our sample was not large enough to calculate the poverty rate of active DFS users, but one might expect the difference between them and the overall population to be larger. A study in Kenya showed that DFS customers were twice as likely to be wealthier than non-users[4].
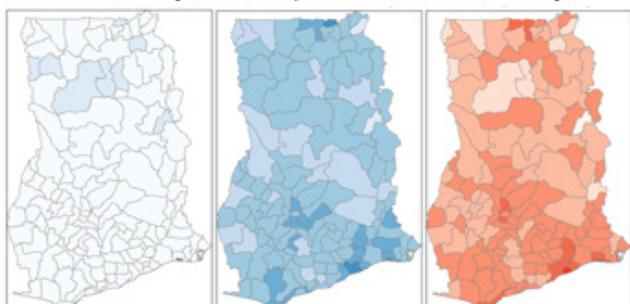
There is a strong correlation between high users of telecoms services and the potential to be an active, regular DFS user. The research found that many telecoms-only customers had a demographic profile similar to these highly active DFS users. The team therefore scored all telecoms subscribers according to the extent to which users are similar to the profile of highly active DFS users, using a model of the 15 most powerful variables which predicts whether a subscriber is likely to become a user of mobile money[5].

Based on the findings, maps were compiled of current and predicted distribution of mobile money users. The first map indicates the actual distribution of mobile money users as of 2014, while the second one reflects the predicted adaption, resulting in the last map highlighting districts with highest concentrations of likely adopters (see Figure 1).

'Classic' Customer Profiling by interview (Socio-economic survey)

In order to build a more complete picture of the profiles of different types of digital financial services customers, IFC designed and commissioned a socio-economic profiling study in Ghana[6]. Based on the average three-monthly volume of Voice/SMS/Data usage, the users were organized into three different segments (High/Mid/Low users). A random selection of 500 subscribers from each segment were interviewed by phone. This brief summary focuses on initial findings regarding demographics, as well as mobile and mobile money usage.

Demographic attributes of customers in Ghana:
Mobile phone users are more likely to be male (61 percent) and relatively young (45 percent of respondents are under 35), with a good literacy level (only 14 percent had none or only primary school education[7]) and access to financial services (66 percent have a bank account[8]).

Key findings from the socio-economic survey

1) Mobile phone usage
- 70 percent of the respondents use one mobile phone, while 30 percent use two or even more mobile phones
- More than half of the subscribers use at least two network providers (56 percent)
- The most loyal clients were among the young (16-24 years) and elderly (+55 years). There is a relationship between loyalty and "High" activity usage, especially among the young.
- There is an apparent gender effect which persists across all three levels of mobile activity:

3 Ghana Living Standard Survey 6 (2012)
4 http://siteresources.worldbank.org/AFRICAEXT/Resources/258643-1271798012256/M-PESA_Kenya.pdf and http://www.mit.edu/~tavneet/M-PESA.pdf
5 The predictions have an accuracy of between 75-86 percent.
6 A similar study is planned for Zambia.
7 The national average is above 41% according to FinScope 2014.
8 Including accounts at formal, non-bank financial institutions such as MFIs. National average is 40.9% (FinScope 2014)

- Only 37 percent of the male interviewees are users of only one MNO, compared to 55 percent of the female users, who seem to switch less between providers while they tend to have lower mobile activity levels on the network they use.
- For women, the combination of using mainly one provider while having low activity levels means that there could be more room for growth for the MNOs that develop marketing strategies that appeal to women[9].
- Across all age groups, the majority of low-activity users use at least two providers indicating that low usage on one network does not necessarily correspond with general inactivity in mobile usage.

2) Usage of Digital Financial Services:
95 percent of the MNO subscribers[10] are aware of DFS, even among older users above 55 years. Most respondents became aware of DFS either through TV or radio advertisements (more than 60 percent), while 19 percent became aware through word of mouth. 57 percent of subscribers of one MNO are actually using DFS.

There is a gap between awareness and usage of mobile money services, with many potential users who are aware of DFS but never use them.

- "Low" GSM activity subscribers have the largest gap between awareness and DFS usage. In addition, there is a great disparity between male and female respondents (see Figure 2). "Low-active" male users have the same level of DFS usage as "high-active" female users.
- The gap between awareness and usage decreases the younger the users are.
- This data suggests that younger people and men tend to be more open to experimentation, and therefore more likely to be early adopters of DFS.

Why are so many GSM subscribers not using DFS in Ghana? It appears that factors related to the agent network and agent quality are not a primary cause of inactivity in Ghana with only 2.7 percent of people claiming that agent availability prevented them from using DFS. A far bigger issue is that there seems to be a qualitative problem around awareness and products: 28 percent of non-users declared that they don't have a need for DFS, which suggests that they may need some explanation how DFS can be used to assist in their financial management, and also that MNOs need to consider whether they have the right products for these customers. 23 percent of customers reported that they had no money to use with DFS, which reinforces the need for customer education since even with irregular incomes, many could still benefit from DFS.

Comparing findings from the socio-economic survey with big data analysis
Customers may have several DFS accounts with different providers, but CDRs are usually only available from one MNO, and the commercial sensitivity of the data makes it extremely challenging to access and combine CDRs from several MNOs. Socio-economic surveys have the advantage of potentially obtaining data about the customers' whole DFS usage behavior with multiple providers. This is an important consideration because nearly one out of five GSM customers use DFS from multiple providers and are likely to have a preferred service that they use most often. As different MNOs can have different average customer profiles, it is important that the socio-economic research takes this into account.

When comparing the findings from the socio-economic survey with big data analysis, the team found differences between "Voice Only", registered (but inactive) DFS users, and active DFS users. Customers who are infrequent users of voice calls are also more
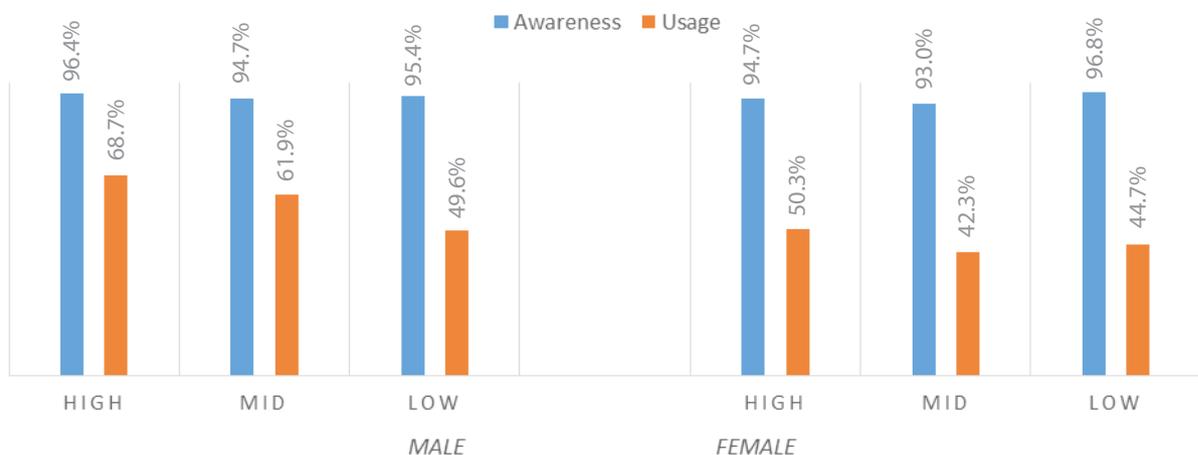

Figure 2: Mobile money services (MMS) – Awareness & usage

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9 According to the GSMA, women mainly need a lot more information, support and reassurance before they trust DFS with their money. See: http://www.gsma.com/mobilefordevelopment/unlocking-the-potential
10 The national average is 93 percent according to a 2013 VISA study (http://usa.visa.com/download/corporate/_media/mm-ghana.pdf)

likely to never have used DFS. Whilst younger people are the most active users of voice, they also have the largest share of registered yet inactive DFS accounts. This suggests that there is room for improvement of the services offered by DFS since these mobile savvy younger customers have not been engaged by the current offerings despite using their phones regularly for other reasons.

It is an important finding that the study confirmed the loyalty and increased usage effect of DFS: customers who were active as DFS clients of one MNO were also more likely to have high usage on the same GSM network.

Conclusion

Big data is a powerful tool, and by enhancing it with consumer profiling research it is possible to target groups of customers with precision. In this study, big data was used to discover the profile of those MNO voice customers most likely to become regular users of digital financial services; research was then used to identify socio-economic groups that fit these profiles but were not using DFS. The research then identified geographic locations with populations having a high propensity to use DFS but that were currently underserved by MNOs. It is reasonable to expect that a combination of targeted marketing and the provision of DFS use cases of relevance to these profiles should result in significantly increased active usage of DFS.

The research focused on two main sources of information. Firstly, from the mobile call detail records we learned that mobile subscribers, who use digital financial services consistently (at least once per month over several months) make for instance more and longer phone calls than subscribers that do not use DFS. Information like this generated through big data analysis helps MNOs to effectively and efficiently expand market reach and promote the use of both DFS and their telecoms business. In Ghana, the use of the findings in this study have already led to the financial inclusion of more than 70,000 additional people.

At the same time, going out and undertaking direct customer surveys - the second source of information used - also has significant value for MNOs. The socio-economic research surveys showed that there is high potential for growth in the mobile money markets examined, given that nearly half of the 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, services and communication strategies that could lead to increased use of digital financial services and ultimately to greater financial inclusion.

In summary, big data analysis is a new and developing tool, offering huge potential to support financial inclusion by precise targeting. However, classic research methods of reaching out and talking to customers will also remain crucial for product development and improvement of services. The research undertaken as part of this study underlines the importance of both.

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The Partnership for Financial Inclusion aims to expand commercial microfinance and advance digital financial services to bring financial services to 5.3 million previously unbanked people in Sub-Saharan Africa by 2017. It is a $37.4 million initiative of The MasterCard Foundation and IFC that brings together the intellectual and financial capital of the Foundation with IFC's market knowledge, expertise and client base. The partnership is also joined by The Development Bank of Austria, OeEB, and collaborates with knowledge partners such as the World Bank and CGAP. An important objective of the partnership is to contribute to the global community of practice on financial inclusion, and to share research and lessons learned. This publication is part of a series of reports published by the program.

To find out more, please visit www.ifc.org/financialinclusionafrica