

## *Field Note 13*

# **DIGITAL FINANCIAL SERVICES AND THE BUSINESS OF MANAGING CASH USING DATA-DRIVEN INSIGHTS TO ADDRESS THE AGENT LIQUIDITY CHALLENGE**

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## EXECUTIVE SUMMARY

Well over a decade has passed since agents were first introduced as an alternative delivery channel for financial services in Sub-Saharan Africa, and they are now an established part of the Digital Financial Services (DFS) ecosystem.<sup>1</sup> Despite agents' undisputed contribution to expanding financial inclusion in the region, challenges remain. Initially, a lack of trust and a need for better agent training were the biggest issues holding back agent networks. Now, improvements in quality of service delivery, agent management, and performance are high priorities. In particular, agent liquidity is now one of—if not the—foremost challenge in building and operating successful agent networks.

There is no shortage of available liquidity solutions—quite the contrary. Super agents, master agents, overdraft facilities, dedicated agent network management companies, and others promise to address providers' liquidity challenges. However, customer surveys conducted by IFC suggest that consumers still experience issues related to liquidity, which in turn represents a major obstacle to DFS use.

The research outlined in this paper moves beyond models that view liquidity only through the lens of rebalancing costs and frequency. Instead, it approaches agent liquidity from a different perspective, using research to zero in on the root causes of this challenge. This approach is based on the premise that successful solutions need to build on deep knowledge of the factors that affect liquidity demand, agent performance, and agent behavior.

To this end, IFC collaborated with Mobile Network Operators (MNOs) and financial institutions providing DFS in three African countries to conduct agent surveys, data analytics, qualitative research, and mapping to uncover key factors that drive liquidity.

The research explores diverse factors that influence agents' abilities and constraints in serving customers. These include fixed agent characteristics such as business type, capital, and customer base; location factors, which affect transaction mix and size; agents' dedication to a specific provider and their agent business; informal rebalancing options; and behavioral factors such as the agents' willingness and capacity to manage liquidity needs and plan ahead.

By leveraging surveys, econometric modelling, and qualitative research, and combining these with segmentation and analysis of behavioral patterns and location factors, this research delivers a more contextualized understanding of the factors impacting liquidity management. It also contributed to the design of an innovative mapping tool that IFC is developing to unify different aspects of agent network management, such as roll-out, sign-up, monitoring, and liquidity. This tool provides a concrete example of how data-driven solutions can push the frontier in liquidity management.

Instead of seeking to ensure the liquidity of each and every agent, the results of this research suggest that creating a reliable ecosystem may be more effective. A reliable ecosystem contains agents with a variety of profiles who reliably execute different types of transactions. It may encompass both formal and informal rebalancing solutions. Critically it allows customers to access agents who will consistently execute requested transactions—and this is vital in order to create and maintain customer trust in DFS.

Too often, providers are hampered by a lack of knowledge of the many factors that influence agent liquidity. This paper provides a starting point for institutions to develop a better understanding of these variables. It underscores the value of conducting applied research and shows how the learnings can be used to design and deploy effective tools and approaches to meet the critical challenge of managing agent liquidity.

<sup>1</sup> Safaricom launched its M-Pesa service in Kenya in 2007.

## INTRODUCTION

The 'Fintech Revolution'<sup>2</sup> is disrupting the traditional delivery model of financial services. Growing internet usage and mobile phone penetration in Africa offer fertile ground for Digital Financial Services (DFS) adoption. There were more than 396 million registered mobile money accounts in Sub-Saharan Africa at the end of 2018, but the markets in this region are still largely cash-based, with 90 percent of all transactions executed in cash.<sup>3,4</sup> While people overwhelmingly receive money physically, and spend it in the form of cash, DFS accounts are often used to transfer or store money.

### The role of agents in DFS provision

In cash-based economies, agents perform the essential function of mediating flows of money in, out, and within the digital system. For low-income individuals using DFS, accessibility of funds is crucial. They need their scarce resources to be at their fingertips when an urgent need arises, particularly as they seldom have credit cards, online banking accounts, or other resources to engage with the digital ecosystem. Agents promise this accessibility to consumers and represent a provider's physical footprint. They serve as points of contact for customer enquiries, while simultaneously performing essential functions such as account registrations, cash-ins, cash-outs, bill payments, person-to-person transfers, and more.

For people who live near or visit an agent, initial usage and the agent's ability to execute transactions determine their DFS experience. As one agent said, "If a customer tries the service a first time and it is not working, he will never try it a second time."<sup>5</sup> If customers have a negative first experience or repeatedly encounter agents who lack sufficient cash or e-float (electronic balance) to process their transactions, they are unlikely to trust or rely on the service. This directly impacts the ability of financial service providers to implement successful agency banking business models, as well as efforts to scale financial inclusion to underserved customer segments.

### Agent liquidity is a key to reliability

Several prior surveys provide evidence of the importance of agent network liquidity in determining customer perceptions of DFS. An IFC survey of 1,200 MSMEs in Côte d'Ivoire who use mobile money services found two out of the three top challenges to DFS adoption and usage related to agent planning and management.<sup>6</sup>

In this survey, 17 percent of the interviewees cited poor geographic coverage and 14 percent cited lack of liquidity at the agent as the biggest challenge. Turning away customers due to liquidity constraints continues to be surprisingly common, even in relatively mature markets. In Tanzania, agents surveyed estimated that they denied 21 percent of transactions due to e-float liquidity issues, while agents in Uganda and Kenya cited this as a reason in 14 and six percent of transactions, respectively.<sup>7</sup>

### Poor liquidity management has consequences

For providers, the implications of poor liquidity management are not trivial. In the short-term, poor liquidity management inconveniences customers, leading to lower transaction volumes and earnings for the agent and the DFS providers alike. In the long-term, it undermines the provider's reputation and becomes a barrier to trust in DFS.<sup>8</sup> This is likely to contribute to customer inactivity and solidifies their reliance on cash-based transactions and informal financial services.

Despite the negative impact of poor liquidity, and an abundance of available solutions, IFC research with financial institutions (FIs) offering DFS found that most did not prioritize agent liquidity management.<sup>9</sup>

Four contributing factors were:

1. The belief that agents can and will handle this challenge on their own
2. The lack of reporting and monitoring tools to assess quality of agents in the network
3. The lack of reliable means to monitor the negative impact of liquidity constraints
4. The costs and capacities required to invest in liquidity management tools

An overarching factor to note is the absence of precise data and knowledge to drive action on agent liquidity. This knowledge gap extends to data on the nature and scale of the problem or how deeply a lack of liquidity can impact customers, agents, and FI business, as well as the status quo of current agent performance. Research is also needed in the space of liquidity solutions, for instance benchmarking of costs and returns of implementing liquidity management systems and training.

### Addressing knowledge gaps in agent liquidity

IFC research conducted as part of the Mastercard Foundation-IFC Partnership for Financial Inclusion sought to fill some of the knowledge gaps surrounding agent liquidity. It used surveys and data analytics to answer three core questions:

- How does location affect the performance of agents, in terms of volumes, fluctuations, and types of transactions performed?
- Do behavioral factors, such as agent motivation and general business acumen, impact performance?
- How can data-driven insights be used to improve agent liquidity management?

The research project included agent surveys in Ghana and data-driven analyses of e-float and transaction volumes in Senegal and Uganda. The different research components provide a multifaceted picture of the needs, challenges, and motivations of agents that providers can leverage to design better agent management tools and systems.

## AGENT LIQUIDITY: THE BASICS

The core value proposition of DFS is to provide security and fast transfers, and to do this at lower costs, with access to additional services, such as loans, buying airtime, and paying bills. This bundle of services hinges on the reliability of the agent network. A 'liquid agent' maintains sufficient e-float and cash at hand to execute customer transactions. For example, when a customer makes a cash-in of USD 20 into her account, the agent receives the customer's cash and transfers USD 20 of e-float to the customer's account. A withdrawal represents the inverse situation: the agent receives the equivalent of the cash-out amount in e-float and hands the customer the cash. The agent's liquidity needs are thus as follows: if customers cash-in, the agent needs e-float to serve them, while he needs cash to execute customer's withdrawal requests.

Agent liquidity management is vital because agents are likely to face shortages of either cash or e-float at unpredictable times. For instance, an agent's liquidity can be depleted if a customer demands an unusually large transaction or if there is an unbalanced customer mix (with many customers asking for one type of transaction). This can prevent the agent from meeting customer requests. Earlier research suggested that the extent of an agent's liquidity challenge was driven primarily by three factors:<sup>10</sup>

- 1) The agent's working capital
- 2) The transaction mix (in terms of cash-ins and cash-outs and timing of transactions)
- 3) The limits on the amount of capital agents have at their disposal

To maintain their ability to transact, agents need to rebalance their cash or e-float. This usually comes at a direct monetary cost, such as fees or transport costs, or opportunity costs from business lost during the time spent rebalancing. Agent liquidity management systems aim to provide rebalancing opportunities that minimize disruptions in service and lower the agent's costs and disincentives to rebalance. Increased agent liquidity should result in higher numbers of successful transactions and improved provider revenue.

### FIs and MNOs providing DFS face different challenges but often apply similar solutions

Liquidity challenges impact both agents who are providing DFS for MNOs (MNO led-agents) and bank agents, who provide DFS on behalf of FIs (either banks or microfinance institutions). Yet, the nature and extent to which these agents are impacted often varies. MNOs tend to have customers who transact more frequently and whose transactions are lower in value. In Kenya, for instance, 42 percent of transactions of banking agents exceeded USD 50. For MNO-led agents, only 27 percent of transactions exceeded this amount. MNO agents had a higher median number of daily transactions, 46 versus 25 for bank agents, even though overall earnings were similar for both types of agents.<sup>11</sup> Compared to MNO-led DFS agents, bank agents often face more volatility and need higher working capital to execute customer transactions. Hence, the profile of bank agents and MNO-led agents differs in terms of transaction mix, frequency, value, and e-float needed, which influences the extent and type of the liquidity challenge they face.

Notwithstanding these differences, the suite of solutions applied in the industry is largely the same for bank or MNO-provided DFS. Widely used solutions include **super agents** (usually other agents or stores with sufficient liquidity) who exchange cash or e-float for a fee; **master agents** who supply liquidity for a fee or share of revenue to agents mapped to them; **branches** where agents can rebalance cash and e-float; **bank-to-wallet (B2W) or W2B transfers** linking an agent's account to an FI account to rebalance e-float; an **overdraft** where agents can access additional e-float if needed; and **big data** solutions that predict an agent's liquidity needs and provide information and alerts to help either agents or providers to proactively deliver liquidity before constraints occur.<sup>12</sup>

<sup>2</sup> Global Findex, 2017.

<sup>3</sup> GSMA, 2019. *The Mobile Economy: Sub-Saharan Africa*

<sup>4</sup> For comparison: in the US, 30% of all transactions are conducted in cash. See: McKinsey, 2018., Boston Consulting Group, 2019.

<sup>5</sup> IFC, 2019. *A New Banking Model for Africa: Lessons on Digitization from Four Years of Operations*.

<sup>6</sup> IFC, 2018. *The Mobile Banking Customer that Isn't: Drivers of Digital Financial Services Inactivity in Cote d'Ivoire*.

<sup>7</sup> MicroSave Consulting, 2017. *Liquidity – Solving Agents' Perennial Problem*.

<sup>8</sup> IFC, 2017. *A Sense of Inclusion: An Ethnographic Study of the Perceptions and Attitudes to Digital Financial Services in Sub-Saharan Africa*.

<sup>9</sup> IFC, 2019. *A New Banking Model for Africa: Lessons on Digitization from Four Years of Operations*.

<sup>10</sup> CGAP, 2011. *Agent Management Toolkit: Building a Viable Network of Branchless Banking Agents*.

<sup>11</sup> MicroSave Consulting, 2017. *Three Steps to Keeping Bank Agents Happy*.

<sup>12</sup> IFC, 2019. *A New Banking Model for Africa: Lessons on Digitization from Four Years of Operations*.

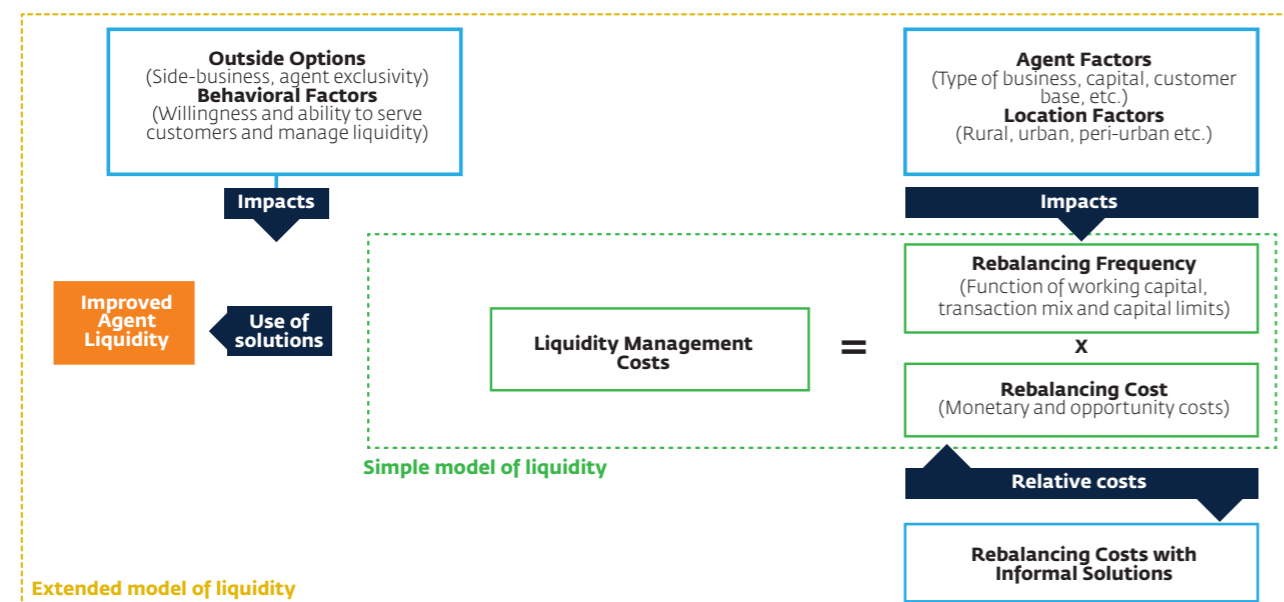
## Examining underlying assumptions of liquidity management

The purpose of liquidity solutions is to enable agents within a network to access sufficient liquidity (cash and e-float) to execute customer transaction requests at all times.<sup>13</sup> However, implementing a solution does not automatically improve liquidity. Rather, it hinges on several assumptions that cannot be taken for granted. First, it is often posited that agents lack information and tools to manage liquidity on their own and thus need support. Second, the absence of formal liquidity solutions is often equated with a lack of effective systems for agents to address their liquidity challenges. Third, it is assumed that if formal liquidity solutions were well-implemented, (almost) all agents would use to them and thus resolve their liquidity issues. While these assumptions may apply under many circumstances, they do not necessarily hold. This is why IFC set out to understand the determinants of agent liquidity and critically examine these underlying assumptions.

### Towards a more realistic model of agent behavior

IFC research shows that agent behavior is more complex than suggested in the simple, three-factor model (see the green box in Figure 1).

**Figure 1. Two models of agent liquidity**



Consideration of additional variables makes for richer insights into the factors that impact liquidity. Three key learnings of IFC's research are showcased in this field note. First, while liquidity management costs are impacted by rebalancing frequency and costs of formal solutions, these factors should not be regarded in isolation. They are influenced by agent and location factors and the rebalancing costs of alternative informal solutions. For instance, an agent who runs a currency exchange business with abundant cash will need to rebalance physical cash with lower frequency compared to a corner shop selling groceries. IFC research in Senegal shows that location matters and is more complex than what simple remittance models, which compare cash-in and cash-out activities between rural and urban environments, suggest. Even within urban areas there is substantial variation, with market areas being cash-out heavy while peri-urban areas appear to be dominated by cash-ins.

Second, the use and cost of managing liquidity is not only driven by formal solutions, but by the availability of informal solutions. Data analytics work by IFC in Uganda that visualized flows between agents uncover informal super agents, with agents preferring to use peer networks to rebalance over formally designated facilitators. Lack of take-up of a liquidity solution is not always a sign that agents don't need or want tools to manage liquidity—they may already have adequate or more effective ways to manage their liquidity, which the provider may be unaware of.

Third, use of liquidity management solutions is influenced by factors beyond a provider's control, such as conflicting incentives or behavioral factors. Agents who serve multiple providers and have limited resources may focus on serving customers affiliated with more profitable providers in order to maximize the commission potential of their limited e-float balances. Agents may also fail to hold sufficient liquidity due to a lack of motivation, willingness, or knowledge; reasons that can only be partially tackled by liquidity tools and may require interventions at the agent selection stage and through training.

The nexus between low liquidity management costs and improved liquidity is not as straight-forward as the simple model suggests. The remainder of this field note showcases how IFC research contributes to a more nuanced understanding of agent liquidity and builds a foundation for grounding liquidity solutions in an empirically validated model of agent behavior. The first case study summarizes IFC research in Senegal, leveraging transaction data to understand spatial and temporal patterns affecting liquidity. Subsequent research highlights how liquidity is impacted by informal solutions, the agent's dedication to a provider, and whether or not the agent operates other businesses in parallel with their agent business. The third case study describes an innovative mapping tool to improve agent liquidity through a data-driven approach.

<sup>13</sup> IFC, 2019. *A New Banking Model for Africa: Lessons on Digitization from Four Years of Operations*.



## WHO ARE YOUR AGENTS? DECODING AGENT TYPES AND BEHAVIOR

IFC collaborated with Baobab Senegal, a microfinance institution, to research transaction behavior of customers who use agents. The research was structured as a deep dive to understand the liquidity patterns observed within the agent network. First, IFC looked at global daily and monthly trends across the entire network. Second, the team investigated the spatial distribution of agents and its impact on transaction volumes and numbers. Finally, IFC's data scientists built a model to predict future transactions at an agent as a function of past behavior and validated the model with ground-truth interview data. The outputs and data analytics insights from the collaboration were used at Baobab Senegal to improve network management.

### Daily and monthly transaction trends observed within the network

IFC leveraged seven months of transaction data from agents in Dakar, Senegal, over the course of 2017 to investigate temporal and spatial transaction patterns in the network.

A visualization of the daily transaction patterns at agents (Figure 2, left graph) shows two peaks: one in the morning around 11am and one in the afternoon around 4pm. Baobab branches are open from Monday to Saturday from 08:30 to 18:30. Sixteen percent of agent transactions are performed outside of branch hours, and these account for 12 percent of the transaction volume. This highlights how agent banking adds value by extending customers' ability to access services beyond usual business hours.

**Figure 2. Daily and monthly transaction patterns (Data: Jan-Aug 2017.)**

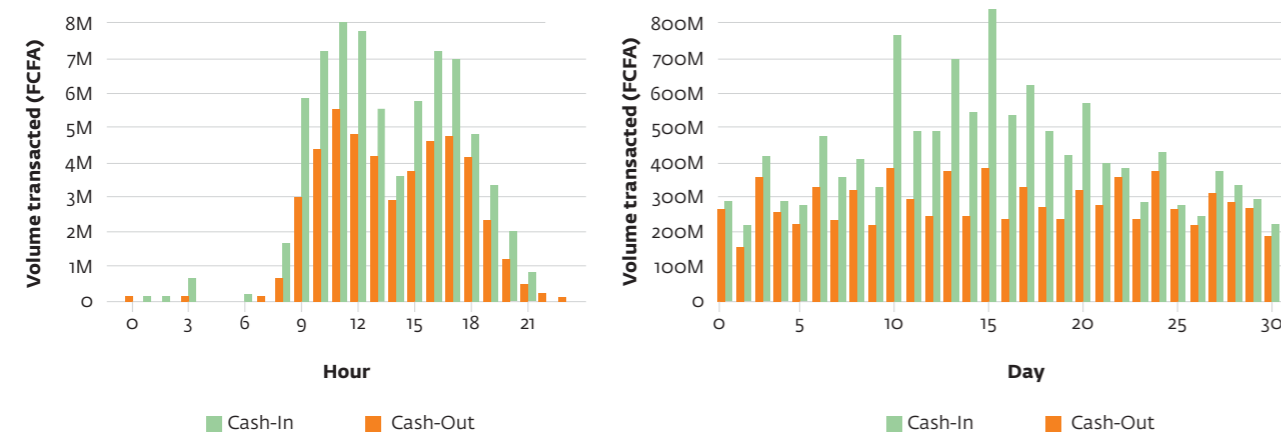


Figure 2 (right graph) shows monthly cash-ins and cash-outs. The peak on the graph occurs during the middle of the month, and illustrates one of the most challenging issues for institutions offering DFS loans through their agent networks. Agents experience asymmetrical flows when customers receive loans disbursements—which are usually highly in value and can occur at any time—while customers with existing loans make recurring, low-value deposits to cover imminent repayments. This drives the peak in cash-ins since these repayments usually come due during the middle of the month.

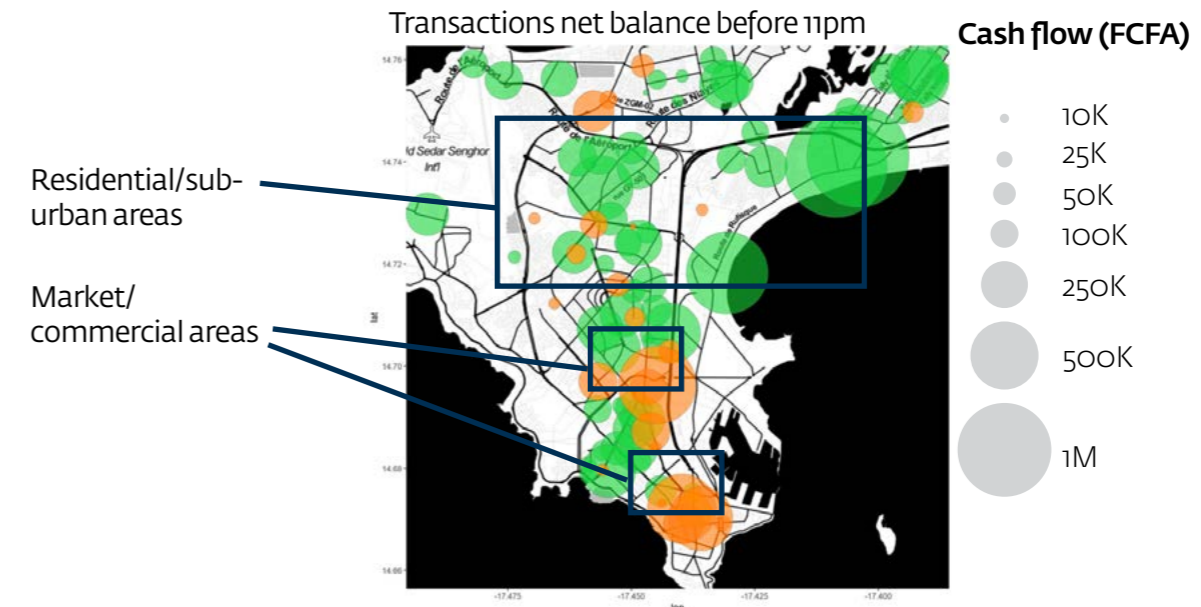
The global pattern in Figure 2, with cash-ins dominant and accounting for 60 percent of transactions both in terms of numbers and amounts, aligns with IFC research into other FIs in Sub-Saharan Africa.<sup>14</sup> It highlights an important difference with DFS provided by MNOs, and has implications for liquidity management. MNOs' transaction mix tends to be more balanced and symmetric than that of FIs, whose digital channels are more oriented to lending and repayments. As FIs face comparatively stronger demand for e-float they need to ensure their agent networks can cope with asymmetries and a systemically unbalanced transaction mix.

### Analyzing spatial patterns of Baobab agents

Spatial liquidity patterns are frequently presented as a dichotomy between the needs and challenges of rural and urban areas. For instance, a recent analysis of MNO-provided DFS found that across four established markets (Kenya, Tanzania, Bangladesh, and India), 60 percent of transactions in rural areas were cash-outs whereas urban areas had a balanced transaction mix.<sup>15</sup> IFC's analysis with Baobab Senegal highlights that there is not only variation between urban and rural areas, but important differences exist within urban areas as well, particularly across residential and commercial zones.

Combining transaction and location data allowed IFC to assess if agents who predominantly perform one type of transaction are spatially clustered or not. The analysis investigated whether agents can be classified as 'net cash-in agents' and 'net cash-out agents'. The mapping in Figure 3 demonstrates that these types clearly exist and are spatially concentrated.

**Figure 3. Net cash-in agents (green) dominate residential areas, net cash-out agents (orange) in market areas (Data: Jan-Aug 2017.)**



Net cash-out agents are shown in orange and are located more frequently in market or commercial areas, such as the city center in the south of Dakar, where there is higher demand for cash withdrawals to pay for goods and services. Cash-in agents in orange dominate in residential and sub-urban locations. Consequently, large green circles show agents who face higher e-float management risk. Large orange circles represent agents with higher cash management risks. Insights of this type can be operationalized in agent monitoring dashboards. Real-time insights into agent liquidity enable providers to track agent performance and design tailored support mechanisms for groups of agents with the same types of challenges.

### Factors which motivate agent behavior

The spatial analysis highlights that agents in different locations specialize in different types of transactions and have corresponding liquidity demands. But how do different agents manage their liquidity in the presence of an unbalanced transaction mix, and when do they turn away customers? IFC conducted quantitative and qualitative research on different agent profiles to decode their behavior. A statistical model provided insights into agents' transaction behavior and was subsequently validated through interviews with selected agents.

This adds nuance to the above classification of net cash-in and net cash-out agents by showing how agent behavior is sensitive to previous transactions, i.e. whether an agent who made a cash-in or cash-out is more or less likely to subsequently execute another cash-in or cash-out transaction. Overlaying the quantitative analysis with qualitative insights provides a window into the motivating factors behind observed agent behavior. The statistical model distilled agent transaction behavior into characteristic archetypes of how those agents, on average, tended to serve customers. Three examples of these characteristic patterns are presented below.<sup>16</sup>

<sup>14</sup> In IFC's longitudinal study with nine partner institutions, 79 percent of the transaction volume was accounted for by deposits, on average. See: IFC, 2019.

<sup>15</sup> Boston Consulting Group, 2019. How Mobile Money Agents Can Expand Financial Inclusion.

<sup>16</sup> Names of all interviewed agents have been changed.

### Box 1. Portraits of three agents and their respective type.



#### “ATM” *Agent Archetype*

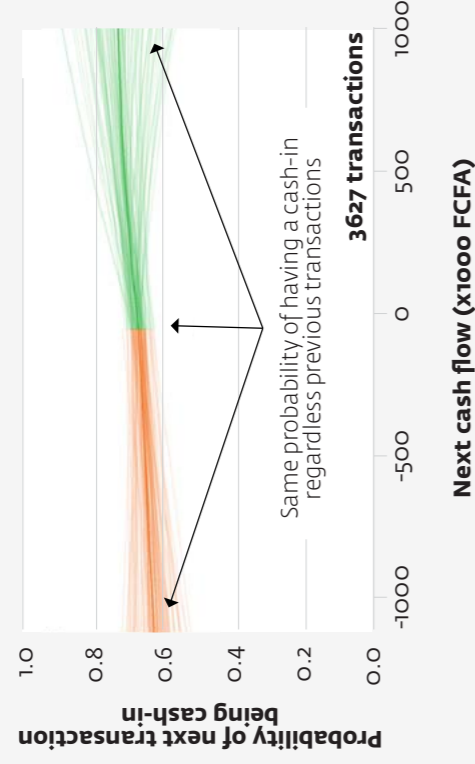
### CHARACTERISTICS AND BEHAVIOR PATTERNS

#### Moussa

Located in the central business district of Dakar, Moussa owns a money exchange business that he started six years ago. He also became one of the first banking agents in Senegal in 2015. Through his currency exchange business, Moussa has abundant liquidity, which is reflected in his transaction behavior. The almost flat line in Figure 4 indicates that the probability of the “next” transaction being a cash-in is around 60 percent (0.6) regardless of the previous transaction.

In other words, even if Moussa cashed-out FCFA 500,000 (USD 850) for a customer, thus substantially reducing his cash liquidity, he is equally likely to serve his “next” customer who also requests another cash-out transaction. Agents of this type are described as “ATM” to reflect their reliable behavior in serving both cash-in and cash-out transactions. Agents such as Moussa are valuable for a provider as they are likely to reliably execute all transaction types, including high-value transactions. This is typically how one might envision an agent’s transaction patterns. However, as the next two examples illustrate, this ideal is not necessarily the norm.

Figure 4. Transaction behavior of an agent of type “ATM”



#### “CASH COLLECTOR” *Agent Archetype*

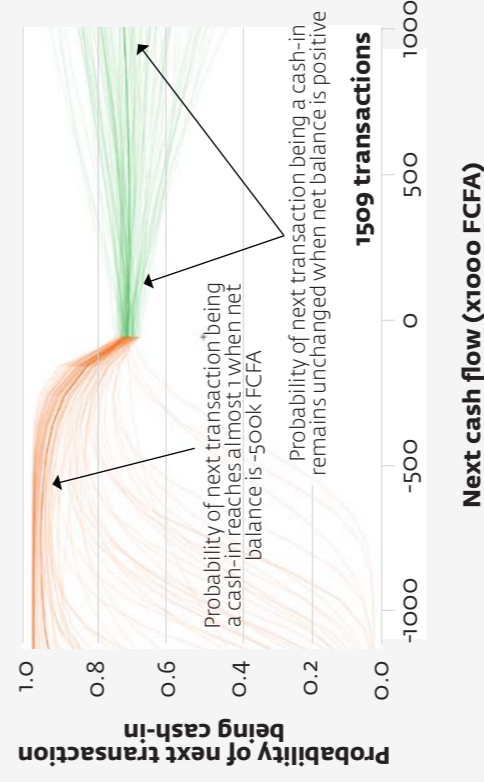
### CHARACTERISTICS AND BEHAVIOR PATTERNS

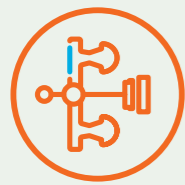
#### Oumar

Oumar owns an IT company, located in the Dakar suburb of Pikine. He started as a Baobab agent in 2015 and offers agent services for three other DFS providers. Most of his customers make deposits or loan repayments. Thus, 70 percent of his overall transactions are cash-ins and 30 percent are cash-outs. Figure 5 shows the typical profile of such an agent: he reliably accepts cash-ins (flat green line) but when customers cash-out (orange segment of the graph), the probability of the next transaction being a cash-in quickly rises to 100 percent. This means the probability of serving a cash-out plummets to zero percent. This model shows total net cash balance on the x-axis. Notably, as Oumar serves cash-out transactions, drawing upon available cash on hand, his ability—or willingness—to serve an additional cash-out drops precipitously. In an interview with IFC, Oumar said he uses Baobab bank accounts only for his agent business and transfers his own income streams to other bank accounts. Hence, while the agent consistently accepts cash-ins, he may purposefully limit the number of cash-outs he accepts to avoid the accrual of large balances in his Baobab account. For “cash collector” agents, it is important to understand whether the observed behavior is demand-driven (e.g. because customers are primarily seeking to do cash-ins) or whether supply-side factors such the desire to limit e-float accrual in the agent account, such as in Oumar’s case, drive them to refuse cash-ins. Addressing supply-side barriers for “cash collector” agents may transform them into full-service agents accepting all types of transactions. However, IFC research questions whether providers should truly aspire (or push) agents to satisfy the “ATM” archetype or, rather, to acknowledge the inherent operational interests at play in businesses such as Oumar’s and instead view these agent types in the context of the broader ecosystem, fulfilling a specific role as primarily a cash-in acceptor and e-float provider, but not vice-versa.

### Box 1. Portraits of three agents and their respective type.

Figure 5. Transaction behavior of an agent of type “Cash Collector”





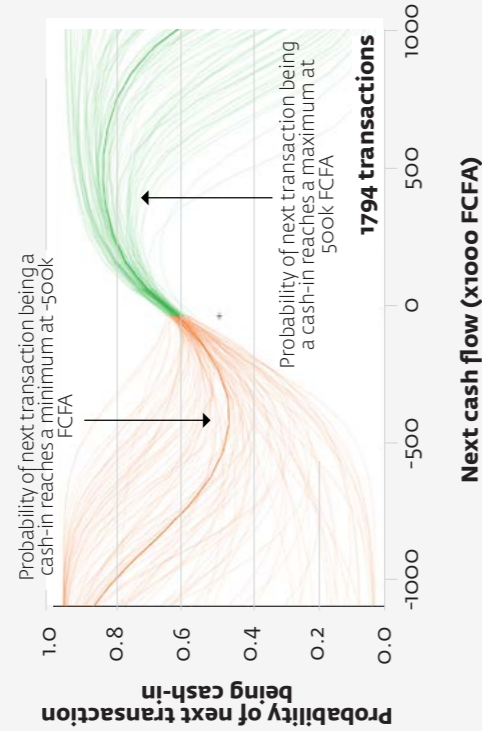
**“BALANCING”**  
*Agent Archetype*

**CHARACTERISTICS AND BEHAVIOR PATTERNS**

**Pape**

Pape has been operating a mobile phone shop for over 20 years in Dakar’s central business district. He started offering different agent services three years ago, much more recently than Omar and Moussa. Agent services have become his core business and generate 60 percent of his revenue. Customer demand is well balanced between cash-in and cash-out. He accepts all transactions but has the lowest e-float requirement of the three agents (FCFA 1 million versus FCFA 11 million for Moussa and FCFA 2.7 million for Omar). When Pape lacks cash for withdrawals requests, he usually asks small businesses around him for informal credit to avoid having to refuse customers. Pape is an example of a “balancing” agent, as depicted in Figure 6. Such agents respond to customer demands but seek cashflow neutrality as indicated by two turning points. These delimit a band of FCFA -500,000 and FCFA 500,000 representing the preferred balance interval that Pape has set for himself. For “balancing” agents such as Pape, it is important to understand what drives the preferred transaction band. Is this driven by demand and would it increase if the agent had more customers, or are there liquidity constraints that keep the agent from accepting transactions beyond the band? Or perhaps Pape simply doesn’t want to keep too much cash on hand due to security concerns, and as he approaches the 500,000 limit, he restricts cash-outs in favor of reducing his cash on hand in return for e-float.

**Figure 6. Transaction behavior of an agent of type “Balancing”**



**Implications of the Baobab Research**

The IFC research with Baobab highlights that agents in urban areas specialize in different types of transactions and form spatial clusters. The assumption that agents are either full-service and liquid or unreliable may not hold. Personal risk appetite and preferences, business characteristics, customer mix, and location, as well as contextual factors, may lead agents to focus on one or multiple types of services. Agents may be reliable in terms of cash-ins but not cash-outs, or they may only accept cash-ins above or below a certain threshold. Instead of aiming to build a network of full-service agents, the research raises the possibility of building networks with a mix of different agents that can meet localized customer demand.

This is important for two reasons. Firstly, agent performance might best be viewed holistically with providers supporting would-be agents to do what they do best. Secondly, for providers to deliver the right kind of support, it is critical to understand that liquidity constraints could reflect deliberate operational choices by agents. A finely-tuned system to deliver cash to agents in need may not resolve the problem if the agent simply does not want to keep additional cash on hand. Recognizing these behavioral drivers is also key, because agents who chose not to serve are unlikely to explain to customers why they are disinclined to facilitate the transaction. Rather, the agent may state the network is down and suggest that fault rests with the provider.

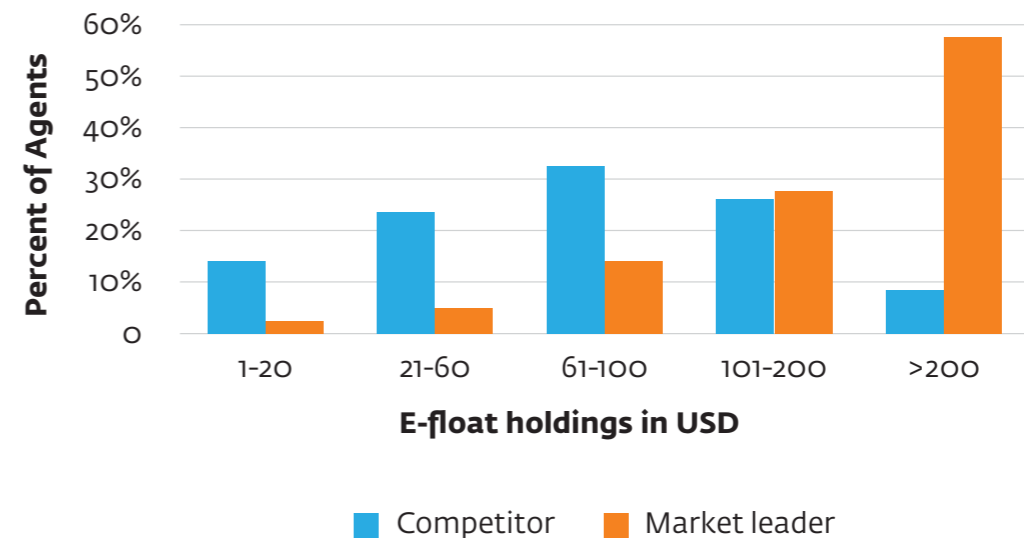
**OUTSIDE THE BOX – HOW FACTORS OUTSIDE A PROVIDER’S DIRECT CONTROL MATTER FOR LIQUIDITY**

In research engagements in West and East Africa, IFC expanded the scope of analysis beyond the vantage point of a single provider. The purpose of these projects was to analyze how factors outside a provider’s direct control, such as competitive dynamics within a market, exclusivity, dedication to the agent business, and informal solutions impact liquidity.

**Agent exclusivity**

In many markets agents are non-exclusive, which is to say they have accounts with multiple providers. Given their working capital limitations, agents are often unable to hold sufficient liquidity with all providers. IFC studied e-float allocation behavior of agents of a provider in a West African country which was not the market leader and whose agents were non-exclusive. This involved the engagement of an agent quality management firm which conducted 10 months of mobile money agent audits. These audits during 2017-2018 reached more than 68,000 agents, 80 percent of whom were visited repeatedly. As part of regular agent visits, auditors captured agents’ e-float levels. The analysis of e-float holdings of these non-exclusive agents across different DFS services revealed clear patterns: agents tended to keep most of their e-float with the market leader—where they expect most customers and the highest overall DFS commission income. In the graph below (Figure 7), the share of agents is depicted across different levels of e-float holdings. Most agents held no more than USD 100 with the competing provider, while 56 percent of these same agents held e-float levels of above USD 200 with the DFS market leader.

**Figure 7. Agents’ e-float distribution for two DFS providers in a West African country (Data: Jul 2017 – Apr 2018)**





Another piece of evidence that illustrates how the relative attractiveness of providers drives behavior of non-exclusive agents comes from Senegal. Using the earlier example of agent Moussa, IFC observed that he used sophisticated spreadsheets to track different business streams. He clarified that in times of limited e-float and cash liquidity, he accepts payments from the service provider that yields the highest fee earnings. IFC also encountered other non-exclusive agents who tried to persuade customers to transact with a different provider where the agent had e-float or would earn higher fee income.

Insights from IFC research highlight that agents are savvy about the earnings potential offered by different providers. Results from surveys and interviews suggest that agents tend to focus their efforts on services that are most beneficial to them. This implies that agent liquidity management poses a bigger challenge to smaller market players and new entrants, as the agent has less incentive to invest financially, given the smaller business opportunities on offer. Audit results also revealed that regular visits, marketing material, and agent training opportunities can significantly improve a provider's value proposition to agents. For instance, during the project, every dollar invested into agent supervision and training generated 1.28 dollars in commission gain per agent over a 10-month period, representing a 28 percent return on investment. This implies that efforts and tools required for liquidity management should vary based on a provider's relative market position and the fee income agents can expect to earn. Without offering agents incentives that match or exceed those of competitors, it may not be a mere lack of liquidity solutions, but also the provider's value proposition that needs to be recalibrated to arrive at improved network performance.

### Dedication to the agent business

Non-dedicated agents are those who run another business, such as offering money exchange services, selling groceries, phones, or other products and services, and this also impacts the ways they allocate cash and manage e-float resources. Providers often have an implicit understanding of the relevance of an agent's other business streams and purposefully recruit certain types of business owners to become agents. However, the impact of other business streams on liquidity is rarely assessed systematically, as most providers lack comprehensive, easily accessible, and digitized data on the agent's business type, income, customers, and other relevant inputs. IFC research from Senegal and Uganda provides glimpses into the effects of dedication on liquidity.

An indication of an agent's dedication to the agent business is provided by the contribution of the agent business to a merchant's total income. For agents with relatively low fee incomes, the agent business is likely to be a side business and not

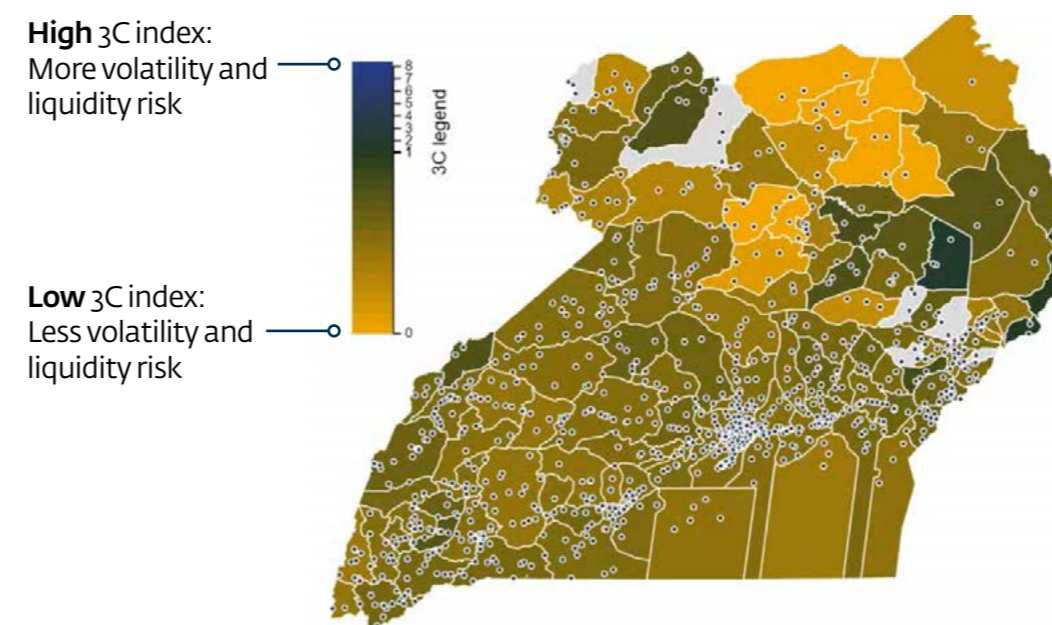
their primary revenue stream. For others, agent transactions represent a major source of income, sometimes overshadowing the importance of other income streams. From agent interviews in Senegal, IFC learned that Oumar (the owner of the IT business) earned 10 percent of his revenue from agent banking, while Moussa (the money exchange shop owner) and Pape (the mobile phone retailer) received 40 percent and 60 percent of their income through agent banking fees, respectively. Agents with substantial earnings from their agent business will more readily accept all types of transactions and larger values, which is confirmed in the profiles presented here. While Moussa and Pape accept both cash-ins and cash-outs, Oumar prefers cash-ins, as evidenced in his interview. Importantly, even though Moussa (the money exchange shop owner) receives a lower share of revenue through his agent business, he is still more liquid than Pape (the phone retailer) as Moussa's business turnover is much larger. Hence, both relative share of income through the agent business and absolute income influence liquidity.

Dedication is not only driven by the economic considerations described above, it is also impacted by psychological factors such as motivation and willingness to manage liquidity well. The influence of the latter factors is particularly difficult to measure. Still, IFC analyses suggest that these factors play a role.

In a research collaboration in Uganda, IFC developed a predictive index<sup>7</sup> to measure liquidity risk, which is approximated by volatility of net cash flows experienced by agents. The index is based on the premise that cash liquidity management is more challenging for an agent when cash flows change rapidly and unpredictably.

Depicted on the map in Figure 8, the results show that agents in the north-eastern districts bordering Kenya experience relatively higher volatility in cash flows (districts in dark brown). One of the implications of this research is that volatility correlates with performance. Thus, when two spatially close agents have vastly different levels of liquidity risk as measured by the index, it is likely that one agent is underperforming due to a lack of appropriate liquidity. These conclusions are still preliminary and need to be validated through model use on a more granular level. However, measuring and benchmarking an agent's liquidity risk against those of proximate agents can identify agents who may lack dedication to their agent business or underperform for other reasons.

Figure 8. Mapping of liquidity in Uganda (Data: Dec 2016)



### Informal liquidity solutions

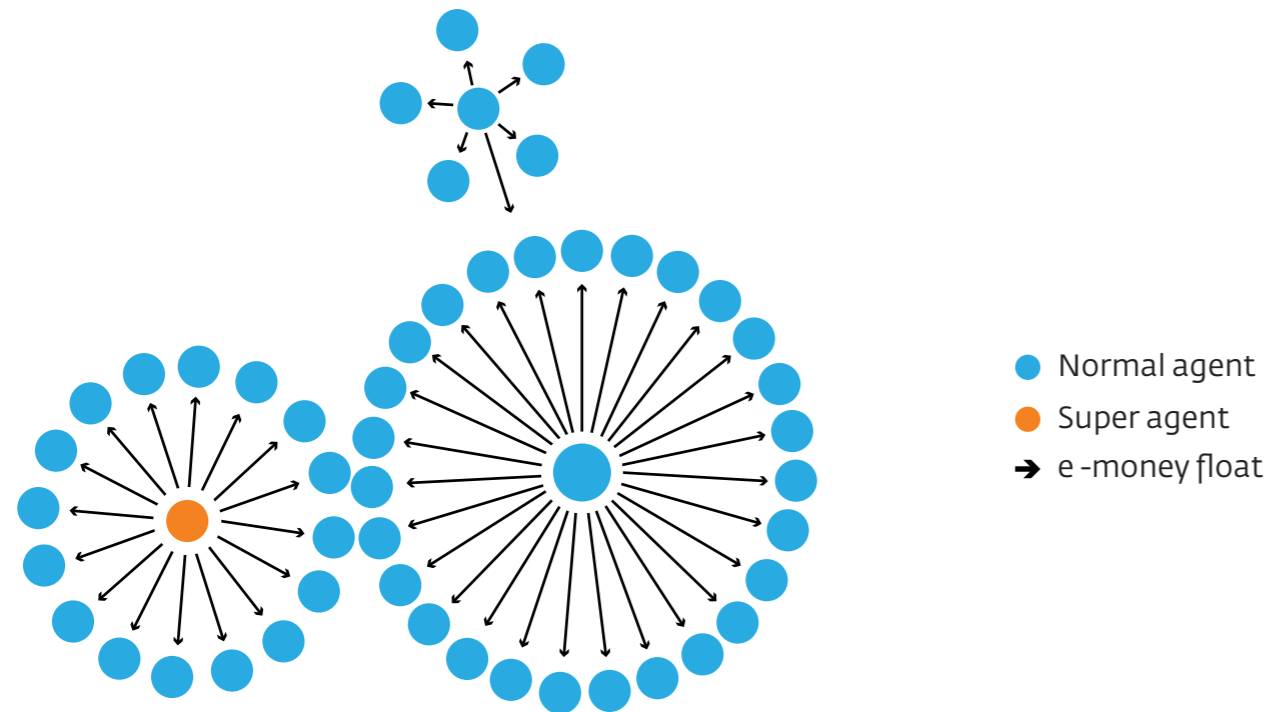
The availability of informal liquidity solutions that emerge in the absence or in parallel to formal solutions, is another often overlooked piece in the liquidity puzzle. Uncovering, understanding, and potentially leveraging these systems is important. They may indicate weaknesses in formal solutions, offer insights into the ways in which agents manage their resources, and provide ideas for improving and creating innovative liquidity solutions. Informal solutions are especially common for cash provision where agents borrow from neighbors, relatives or nearby businesses to avoid refusing withdrawals when their cash liquidity is low. This is exemplified by Pape, the mobile phone retailer in Dakar, Senegal, who said he asks small businesses located nearby to provide him with informal credit if he needs cash for transactions. Agents in Senegal were also found to coordinate their liquidity needs through WhatsApp groups, supporting each other with e-float.

In collaboration with Topix and a DFS provider in Uganda, IFC leveraged transaction records and data visualization to map liquidity flows between agents. The analysis uncovered informal super agents (i.e. agents who provide e-float to other agents) and delivered insights on the back channels agents use to remain liquid.

Atomic graphs in Figure 9 map the relations between agents, in this case a subset for illustrative purposes, with arrows representing the direction of e-money flows between agents. IFC leveraged the directionality of flows to identify super agents (agents who support others with e-float) and compared the classification with the list of official super agents held by the provider. Discrepancies between the two lists point to unexpected agent behavior.

The agent in the center of the left circle marked in orange in Figure 9 is a formal super agent supplying liquidity to other agents, marked in blue. However, the blue agent in the center of the right circle is a 'normal' agent who provides liquidity to a larger number of agents than the formal super agent. This raises the question of whether the optimal agent was selected to become a super agent. The value add of these analyses is to identify key agents (both formal and informal) within the network and to map agents' actual rebalancing behavior.

**Figure 9. Identifying informal super agents using atomic graphs**



**Benefits of understanding informal liquidity solutions**

Analyzing informal liquidity provision channels is essential for an overview of the whole universe of tools agents have at their disposal. The objective of this exercise is not to dismantle informal solutions but first and foremost to understand them and reflect what purpose they serve and how they may contribute to improving liquidity. It is important to recognize that informal solutions often come with positive side-effects. WhatsApp groups strengthen social bonds between agents and could lead to greater knowledge exchange and shared learning between agents. Informal super agents may help to balance uneven liquidity within a network by supplying excess e-float to agents in need. Thus, informal solutions should not always be replaced or formalized. They could be integrated into a multilayered system that encompasses both formal and informal tools and recognizes agents' abilities to self-organize and address their liquidity challenges.

**BUILDING OPTIMAL AGENT NETWORKS**

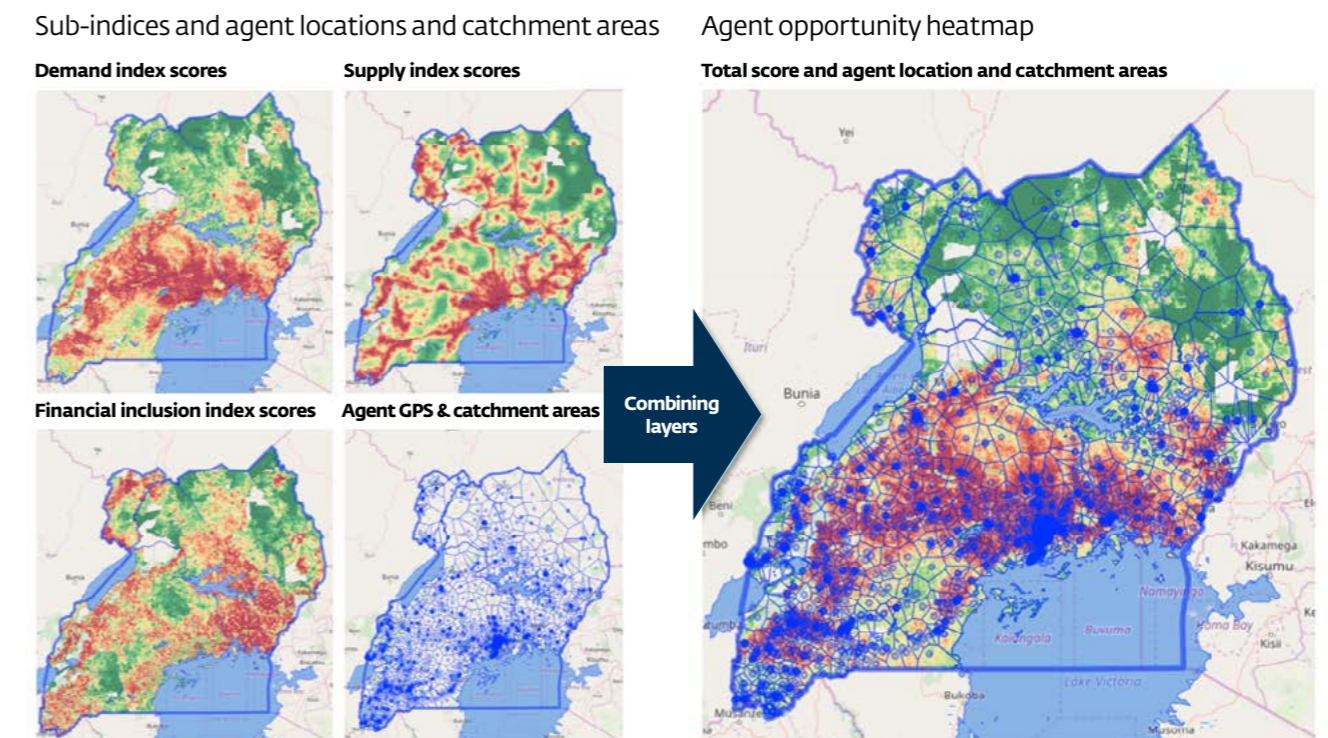
IFC is currently designing a tool for managing agent networks, tying together learnings from several research activities on agent liquidity. This new agent mapping tool is based on the premise that agent network management needs to be approached in a holistic manner. Decisions at the agent recruitment stage, such as locations for expansion and the demographics, business, and dedication of agents targeted for onboarding, matter for liquidity. Recruitment, rollout, and management should not be disconnected, as decisions within each of these areas have ramifications for agent network performance. For these reasons, IFC decided to pilot a tool that identifies high-opportunity areas for rollout and monitors and tracks agent performance once they are signed-up. By leveraging the synergies of optimized agent placement for liquidity, the tool promises to deliver a more integrated solution to managing an agent network. Currently, IFC is focusing largely on the tool's functionalities related to rollout, and additional liquidity-related functions will be incorporated when agents become active.

IFC developed the tool jointly with a DFS client. The first step was to assess the client's strategic priorities, competition, infrastructure needs, and financial inclusion objectives. Based on this analysis, three key factors emerged as the optimal parameters of the mapping tool:

- 1) Demand: Locations of customers who make-up the client's target group
- 2) Supply: Availability of electricity, communications, and other vital infrastructure enabling agents to operate, as well as a favorable competitive environment
- 3) Financial Inclusion: Location of underserved customers and the scope to expand financial inclusion

IFC obtained relevant input data in 1.0 km<sup>2</sup> resolution, for instance population, electricity access, or the presence of financial access points within each 1.0 km<sup>2</sup> block. There were 16 input layers in total, and these were combined to create a heatmap of demand, supply, scope for financial inclusion, and an overall score.

**Figure 10. Developing the agent opportunity heatmap**





**Figure 11. The client has placed most agents in high-potential areas**

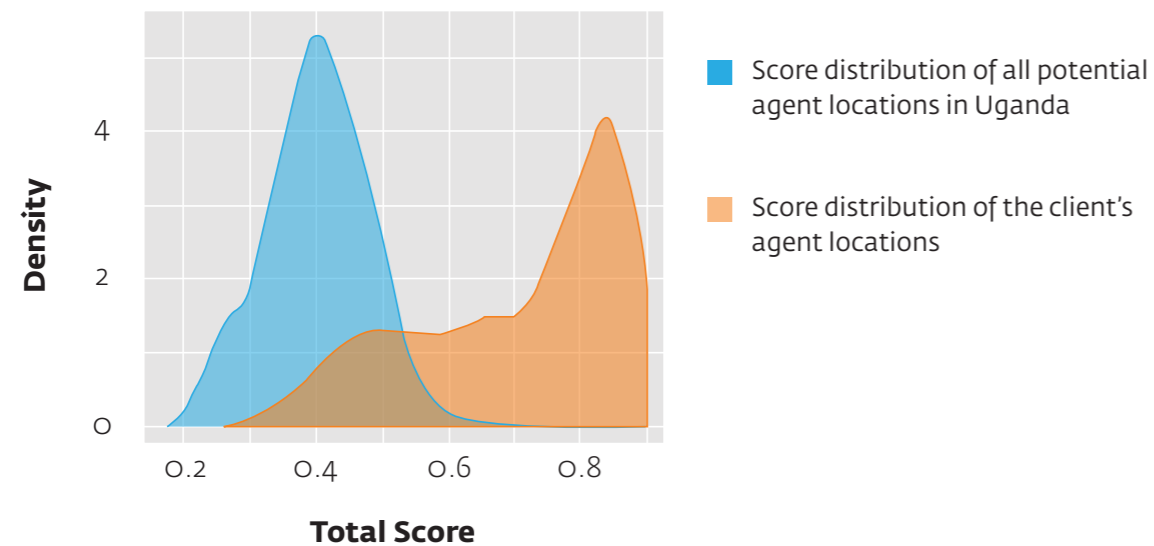


Figure 10 shows the distribution of opportunity according to the three selected dimensions and the overall index value. High-opportunity areas tend to be concentrated in the South of Uganda and around big cities. While this may already form part of the provider's implicit knowledge, the value-add of the index is that it systematically assesses the potential of each and every block with a high level of granularity (1.0 km<sup>2</sup> scale).

IFC also overlaid these maps with agent GPS locations and their catchment areas to assess how well the current network covered high-potential locations. Overall scores are normalized between 0-1, with one indicating very high opportunity and zero indicating low opportunity. In this case, the results show the provider has systematically placed agents in high-opportunity areas, with the distribution of scores skewed towards high-opportunity (Figure 11). Importantly, such analysis can identify high potential areas with insufficient agent coverage and inform rollout strategies. It can also benchmark agent performance against location potential and identify underperforming agents. IFC plans to augment the tool's functionality by adding greater performance tracking with up-to-date information and liquidity analytics.

The agent mapping tool represents an important step towards a systemic approach to agent network management, encompassing agent network expansion and sign-up, monitoring, and performance tracking. IFC plans to apply the tool in other countries, thereby cross-validating the scoring methodology and extending and adapting the tool to client needs.

## CONCLUSION

Agent liquidity is among the most persistent challenges facing providers when building economically viable, reliable, and trustworthy agent networks. Despite the availability of tools, providers have not necessarily been able to fully address and resolve this critical issue. While efforts often focus on implementing solutions, IFC research emphasizes the importance of first understanding the problem. In multiple engagements, the team investigated internal and external factors that drive agent liquidity. This puts agent liquidity management on a new foundation, basing recommendations and action on insights into agents' needs, challenges, and behavior. Key factors IFC found to impact liquidity in the specific contexts investigated include:

- **Fixed agent characteristics:** Business type, capital, customer base, and other factors impact liquidity and can be observed by providers at the rollout stage. IFC research in Senegal validated that larger turnover has a beneficial effect on agents' willingness and ability to execute customer transactions.
- **Location:** The distinction between rural versus urban locations, as well as suburban versus central urban, matters for liquidity. In Senegal, IFC found that agents in city centers and close to markets tended to execute predominantly cash-outs, while sub-urban agents registered a larger share of cash-ins.
- **Outside business options:** An agent's dedication to a provider's business is affected by expected earnings through agent services for competing providers, as well as other income streams. In West Africa, IFC observed that agents allocated e-float to the market leader from whom they anticipated most business. Similarly, agents with limited resources or alternative business streams may not make investing in the agent business a priority. Providers whose agents have attractive outside options need to offer greater incentives or increased training and support to motivate agents.
- **Behavioral factors:** Willingness and ability to serve customers affect user experience and liquidity available at agents. Better understanding these hard-to-study factors can benefit recruitment and incentivizing agents to manage liquidity well.
- **Informal rebalancing:** Alternative liquidity and rebalancing options provided by other agents, such as WhatsApp groups in Senegal or the informal super agent services IFC observed in Uganda, matter as well. Providers are often unaware of these services and how they affect the need for and usage of formal solutions.

Factors identified in IFC research are important, but not necessarily in all contexts, which calls for further research and validation. Nonetheless, the findings already call into question some conventional wisdoms on liquidity management. First, providers may need to reassess the assumption that agents are able and willing to serve all customers. Agents may specialize in certain types of transactions. They may prioritize a competitor over the provider's agent services, or they may favor a different business stream. This means efforts to improve the performance of all agents may not always bear fruit. Segmenting agents according to their profile, as IFC did in Senegal, can decode which types of transactions agents reliably execute. It can show where customers have access to an agent mix that fully serves their needs, or where reliable agents for specific types of transactions may be missing. Interventions that ensure customers are better served in certain locations may be more effective than trying to ensure each and every agent is liquid and willing to perform all types of transactions.

Second, poor liquidity management by agents does not always mean that more liquidity support is needed. IFC research in Uganda suggests that volatility could be a proxy for how serious agents take their business. Devoted agents may overcome challenges themselves instead of relying on formal solutions if they perceive the benefits to be sufficient. Examining incentive structures, understanding who is likely to serve customers and under which conditions, as IFC did in Senegal, and knowing in advance when agents are likely to face constraints, are all key. Such knowledge is a prerequisite for interventions that target agents who are unable to manage liquidity risks themselves.

Finally, IFC's mapping tool raises the possibility of designing integrated strategic planning and liquidity solutions that incorporate location factors, assess agent placement, benchmark agents against their potential, and provide the option of predictive analytics and segmentation of agents based on performance and needs. More centralized planning and a one-stop solution can simplify agent liquidity management by streamlining and standardizing processes for assessing agent performance and addressing shortcomings. This highlights the potential of more unified approaches to liquidity management. Instead of separating liquidity from other aspects of operations, and adding complexity, new data driven tools could bring aspects of rollout, recruitment, and monitoring together and facilitate providers' strategic decision-making and agent network operations.

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