mastercard foundation

Partnership for **FINANCE** *in a* **DIGITAL AFRICA**

Building the infrastructure for a healthy digital financial ecosystem

Caribou Digital

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NOTES

The views presented in this paper are those of the author(s) and the Partnership, and do not necessarily represent the views of the Mastercard Foundation or Caribou Digital.

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ABOUT THE PARTNERSHIP

The Mastercard Foundation Partnership for Finance in a Digital Africa (the "Partnership"), an initiative of the Foundation's Financial Inclusion Program, catalyzes knowledge and insights to promote meaningful financial inclusion in an increasingly digital world. Led and hosted by Caribou Digital, the Partnership works closely with leading organizations and companies across the digital finance space. By aggregating and synthesizing knowledge, conducting research to address key gaps, and identifying implications for the diverse actors working in the space, the Partnership strives to inform decisions with facts, and to accelerate meaningful financial inclusion for people across sub-Saharan Africa.

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What we know

Digital financial services is an evolving industry so the ecosystem supporting it must also continue to evolve

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The next-generation of financial services (NGFS) will only thrive if the ecosystem infrastructure is robust, reliable, and dynamic. A robust and reliable infrastructure builds trust with consumers, and a dynamic infrastructure is flexible enough to adapt to new consumer demands, trends, or technologies. Three core infrastructure pillars collectively define the "ecosystem"—at least from a supply-side perspective:

- operational,
- technical, and
- regulatory.

While the evolution of digital finance has accelerated remarkably over the past decade, persistent challenges across all three pillars are jeopardizing that growth. **This Snapshot will focus on infrastructure improvements that will need to take place at the ecosystem level in order to deliver digital finance effectively.**

The major challenges faced by the three core pillars are:

— *Operational infrastructure: building on physical innovation*

One of the most disruptive innovations in digital finance was the new operational infrastructure that allowed financial services to shift away from the costs of *brick and mortar* banks. Agents and mobile phones meant that digital finance could be delivered faster and at a much lower cost than by bank branches. However, while this infrastructure was arguably the trigger for scale, the required investment is heavy and the costs to set up and maintain the infrastructure remain challenging.

While agents have a greater reach than banks, uptake has been inconsistent, particularly at the last mile where growth is hamstrung by a lack of agents. Moreover, the cost of managing an effective agent network can account for more than half of the total operational costs of a top provider,[1] making the extension of the agent network an expensive proposition. This is particularly true in rural areas, which often pose substantial economic and operational barriers to building an agent network.[2] Nevertheless, as the industry evolves beyond a narrow view of "best practices," new and more inclusive delivery models are likely to emerge.

— *Technical infrastructure: improving platforms, accessibility, and security*

As the digital finance industry advances, technical infrastructure has become increasingly important for several reasons. Firstly, the platform is the core foundation for technical service delivery. Secondly, the lack of globally-accessible Application Programming Interfaces (APIs) has been a barrier to digital finance's ecosystem growth. However, the increasing penetration of smartphones in sub-Saharan Africa is helping to break down this barrier. Lastly, as more digital finance services scale and providers explore the internet-based solutions, technical infrastructure has become critically important in the context of security.

1 GSMA, "2015 State of the Industry Report (Mobile Money) Executive Summary."

2 Gilman et al., "Spotlight on Rural Supply: Critical Factors to Create Successful Mobile Money Agents"; Innovations for Poverty Action and CGAP, "Financial Inclusion for the Rural Poor Using Agent Networks in Peru"; Reyes Salomón, Díaz, and Arabéhéty, "Banking Agents in Colombia: Rural Expansion and Its Frontiers"; Ogwal, "Innovating with and Managing Rural Agents."

Platforms

Mobile money was one of the earliest forms of digital finance and was built on similar logic to airtime distribution. As a result, the earliest version of the platforms were airtime recharge platforms adapted for payments use cases. While this approach allowed for rapid service testing, DFS provicers eventually realized the need for built-for-purpose platforms. As early as 2012, Vodafone was planning for an entirely new platform for the growing M-Pesa service.[3]

In 2013, GSMA outlined basic considerations for platform upgrades:

- the platform should be adaptable to new product development, the service delivery channels and variable customer growth rates; and that
- basic platform provider prerequisites include: disaster recovery mechanisms, detailed service-level agreements (including user/vendor responsibilities, tech support, escalation procedures, penalties for non-compliance, e.g., service outage, capacity planning/ service usage), change request management, a product roadmap and multiple platform environments.[4]

Globally-accessible infrastructure: APIs

Recently, technical conversations have shifted away from foundational discussions to explore the link between adequate technical infrastructure and growth in ecosystem transactions. The volume of ecosystem transactions—a term that refers collectively to bill payments, international remittance, merchant payments, and bulk disbursements—is an important proxy for this stage of development in the digital payments landscape. Although the volume of ecosystem transactions in mobile money has more than doubled since 2011, they still represent less than 20% of all transactions.[5] Inflexible or inaccessible technical infrastructure, particularly for third-party integrations, is a binding constraint for ecosystem growth.

Although there has been some progress in providing APIs across providers, according to GSMA's "2014 State of the Industry" report, just under two-thirds of respondents (MNOs) had APIs—a further 24% said they were planning to provide API access within the next twelve months.[6] These statistics were an early indicator for how easily others could build services on top of the mobile money rails. *"In the case of mobile money, the API defines the way a developer should write a program that successfully requests services from the mobile money platform. For example, this would allow an application like Uber or Amazon to seamlessly link directly to a mobile wallet instead of a credit card or bank account."*[7]

However, while digital finance providers are investing in APIs, not all APIs are created equal. According to CGAP, most mobile operators stopped short of fully optimal APIs, allowing access only to a carefully vetted set of partners.[8] While some argue that security concerns have held back the development of accessible APIs, market fragmentation also slowed any potential innovation that APIs could have offered.

Most APIs have been built unilaterally: providers developed unique, proprietary API documentation. As a result, any organization that wanted to integrate with multiple providers has to conduct multiple integrations, even within the same market. This was the key driver for GSMA's efforts to harmonize mobile money APIs, an initiative discussed further below.[9]

The absence of harmonized, accessible APIs, gave rise to aggregators, technical service providers that took advantage of an opportunity to provide—or aggregate—indirect access to mobile money providers. While these aggregators play a useful role for organizations that lack in-house tech capabilities, this is an expensive and inflexible option for most technology start-ups (see Text Box 1).

3 Tmforum, "Kenya Safaricom Successfully Migrates M-PESA to Huawei G2 Platform."
4 McGrath and Lonie, "Platforms for Successful Mobile Money Services."
5 GSMA, "State of the Industry Report on Mobile Money: Decade Edition: 2006–2016."
6 Scharwatt et al., "2014 State of the Industry: Mobile Financial Services for the Unbanked."
7 Tellez-Merchan, "Can Open APIs Accelerate the Digital Finance Ecosystem?"
8 Thomas and Watson, "Partnership: Missing Ingredient to Mobile Money APIs."
9 Camner, "Launching GSMA Mobile Money APIs to Raise Industry Capabilities."

BOX 1 The rise of aggregators in the absence of technical infrastructure

Aggregators allow payment service providers (e.g., MNOs or banks offering DFS) to link to third parties (such as donors, businesses, governments), enabling them to offer bulk payments/disbursements. Aggregators are most often tech companies that identified an opportunity in the DFS ecosystem. Their business model depends on high volumes as revenue is typically on a per-transaction basis—making bill pay the most lucrative aggregation service.

Within the DFS industry, aggregators have:

- helped develop the DFS ecosystem, offering more use cases to customers
- offered VAS beyond core integration, such as bulk SMS notifications, real-time validation, etc.
- reduced the cost and timeframes for MNOs (MNOs could do this themselves, but at a much higher cost and with longer timeframes)
- Aggregator challenges:
- limited financial capacity — some aggregators struggle with tech upgrades
- technical struggles in managing volumes of disbursements
- operational issues with bandwidth
- vulnerability to MNO and bank limitations such as regulation, turnaround times, and pricing structures

The future for aggregators remains unclear, as they feel pressure from MNOs who are squeezing them on already slim margins and trying to integrate directly with third parties.

Adapted from: Pillai and McKay, "Understanding the East African Aggregator Landscape."

Security

Security is the final area of focus for technology infrastructure. From a technical perspective, the increasing importance of security relates directly to the adoption of smartphones and apps. Specifically, the security of mobile money apps has raised some concerns: Reaves et al. tested the registration, login, and transaction procedures of a range of mobile money apps in developing markets and found that *"the majority of these apps fail to provide the protections needed by financial services…threatening to erode trust in branchless banking and hinder efforts for global financial inclusion."*[10]

A further study was conducted by Castle et al. who confirmed that there are serious failings in the security of some mobile money apps, although they argue *"the situation is not as dire as it may seem—many issues can be resolved by security best practices and updated mobile software."*[11] While app security is an area of growing importance, the challenges appear to be solvable—at least theoretically—and apps are still in nascent stages.

Regulatory infrastructure: A focus on identity

The third pillar of ecosystem infrastructure is regulation, a huge topic that encompasses the policy frameworks, approaches, and guidelines that ensure systemic stability without stifling innovation.[12] As regulation is a principal factor for success in digital finance,[13] FiDA is dedicating a separate Snapshot to the broader evolution of regulation for NGFS. When considering the regulatory infrastructure alone, one area has become increasingly important with regard to enabling future innovation in financial services: identity.

Identity is critical to managing fraud and anti-money laundering, that is, combating the financing of terrorism (AML/CFT) concerns inherent to offering financial services. However, identity has also been a major barrier to adoption. According to Findex, 18% of financially excluded adults—the majority of whom live in Africa and Asia—are unable to access financial services due to a lack of documents that validate their identity.[14] Identity has become such an important global issue that it is core to the UN Sustainable Development Goals and, according to the World Bank's ID4D program, it is particularly important for financial inclusion. Better identification systems

10 Reaves et al., "Mo(bile) Money, Mo(bile) Problems: Analysis of Branchless Banking Applications in the Developing World."
11 Castle et al., "Let's Talk Money."
12 He et al., "Fintech and Financial Services: Initial Considerations."
13 Naghavi et al., "Success Factors for Mobile Money Services: A Quantitative Assessment of Success Factors."
14 Demirguc-Kunt et al., "The Global Findex Database 2014: Measuring Financial Inclusion around the World."

could enable 375 million more adults to access formal financial services.[15]

The most significant innovations in recent years have centered largely on huge bets on biometric, state-run program like **NADRA in Pakistan** and **Aadhaar in India** as well as the Mastercard partnership in Nigeria.[16] Early evidence has been positive, in terms of the ability for large state-run programs to reach huge previously, excluded parts of the population. In 2015, 50% of all mobile wallets in Pakistan—a country dominated by over-the-counter transactions—were opened via biometric verification.[17] Equally, Aadhaar enabled the Direct Benefit Transfer program in India, which from its launch in 2014 to December 2016, allowed the Indian government to save 500 billion rupees (approximately $7.4 million).[18]

Biometric programs have also raised questions around the potential risks associated with implementation,[19] especially with regards to security, managing privacy, and reliability/reusability. The programs have provoked more extreme reactions with some analysts going so far as to compare the Nigerian biometric identification pilot to an Orwellian future sponsored by corporate investment.[20] The most persuasive argument raised by biometrics' critics—especially when used for identification—is that using this data requires organizations and government agencies to maintain a high level of technical and organizational security.[21] The loss, theft, or misuse of biometric data compromises an individual's private data and identity.[22] Further, sharing any of this data implies that an individual has given their consent, which in turn implies that the individual understands how and why their data is being used by third parties.

Lastly, biometric-based identification can return false matches either because the system does not identify a match when it should, or because it does identify a match when it should not.[23] These errors typically reflect inaccuracies in the process of recording the biometric data. For example, many lifelong Indian manual laborers have no readable prints due to worn finger pads, which makes authentication difficult for the Aadhaar program.[24]

Thus, although biometric identify programs and infrastructure can improve access to financial services, it is clear that managing privacy, security, and the risks associated with the implementation is an ongoing area of learning.

15 GSMA, "Digital Identity: A Prerequisite for Financial Inclusion?"
16 Pymnts.com, "MasterCard Sees Opportunity With Nigerian E-ID Cards."
17 Rashid and Staschen, "Unlocking Financial Inclusion Using Biometrically Verified SIMs."
18 Sharma, "Direct Benefit Transfer Lead to Rs 50,000-Crore Savings for Government in 3 Years."
19 Medine, "India Stack: Major Potential, but Mind the Risks."
20 O'Grady, "Nigeria's Orwellian Biometric ID Is Brought to You by MasterCard."
21 "Biometrics in the Humanitarian Sector."
22 Ibid.
23 Ibid.
24 Goel, "'Big Brother' in India Requires Fingerprint Scans for Food, Phones and Finances."

Notable new learning

Greater investment in tailored, local operational infrastructure and standardized, global technical infrastructure

— *Exploring new operational solutions to better match local market contexts*

The last mile remains a persistent challenge just as the economics of reaching remote and marginalized communities remains challenging for much of the private sector. Philanthropic capital has provided, and should continue to provide, the risk capital for early stage initiatives focused on last mile solutions. As global organizations, including CGAP, GSMA, MicroSave/the Helix Institute of Digital Finance, and MM4P, continue to invest in better understanding the barriers facing last mile adoption, new players exploring opportunities at the last mile will likely lead to innovation coupled with developments in the operational model built on the "shared economy," as explained below.

A major challenge for payment service providers (PSPs) is the ability to focus on remote markets because of limited investment capital.[25] At the same time, aggregators acting as pure tech providers may become less viable as PSPs improve APIs and directly integrate with third parties. As a result, there is an early trend of aggregators shifting toward new roles in the value chain and serving remote and marginalized markets that PSPs have largely ignored. MM4P's work on digitizing the coffee value chain is the most recent and obvious example of this dynamic. While MTN was a key partner for network coverage and mobile money wallets, Yo Uganda, an aggregator, designed the bulk payment solution.[26] Typically, this is the PSP's responsibility, however, given the rural and complex nature of the delivery, it was not within MTN's strategic priority, which gave Yo Uganda the opportunity to execute directly. Although this model relies on the technical infrastructure of MTN, it is an early indication of how others can fill the operational infrastructure for harder-to-reach populations.

In addition to new players, there is a new debate considering alternative forms of an "agent" in the context of a "shared economy." This model, built on matching supply and demand, has been popularized by numerous businesses including Uber and Airbnb, with economists heralding its many positive attributes.[27] In digital finance, this type of model could lend itself to local communities by directly addressing cash shortages for agents in remote areas. The agent would be akin to a customer calling for an Uber taxi; the community members would be the Uber drivers who only switch on the 'cash provider" app when they have surplus cash. There could also be surge pricing in times of high demand.[28] While this model could better match supply and demand, there are inherent challenges associated with this approach, such as security concerns and the process of onboarding. Even Uber continues to struggle with retention as only an estimated 4% of drivers stay on the system year-on-year.[29] While there is significant promise in the shared economy approach to liquidity management, there is no straightforward solution as of yet.

25 Morawczynski et al., "Digital Rails: How Providers Can Unlock Innovation in DFS Ecosystems Through Open APIs."
26 MM4P, "Digital Money Today or Cash Tomorrow?"
27 The Economist, "The Rise of the Sharing Economy."
28 Hanouch, "The 'Uberification' of Financial Inclusion: What's Possible?"
29 McGee, "Only 4% of Uber Drivers Remain on the Platform a Year Later, Says Report."

— *Standardized and globally-accessible technical infrastructure seeks to lay a foundation for new innovation and ecosystem growth*

In terms of technical infrastructure, digital finance actors have focused on building digital rails through open and/or standardized APIs. However, the "laissez-faire" market approach for technology is proving ineffective in enabling the ecosystem. As a result, four key industry initiatives aim to drive a more accessible infrastructure.

First, the GSMA has led an industry initiative aiming to reduce market fragmentation through harmonizing mobile money APIs. Market fragmentation has been a key challenge preventing third-party integrations and, by extension, ecosystem growth.[30] GSMA is relying on best practice principles, including REST architecture and ISO standards to develop APIs for core mobile money use cases. The first set of harmonized APIs were published in October 2016.[31]

CGAP has concurrently worked with providers on an Open API campaign in order to build the digital rails.[32] Within this work some key industry guidelines for building sustainable infrastructure have arisen.[33] Among the design principles, CGAP recommends building the organizational capacity to support APIs and creating the appropriate technical infrastructure, such as a sandbox and recourse mechanism, to enable third-party developers to integrate more efficiently and seamlessly.

Third, the biometric Indian program referred to earlier, Aadhar, is supported by **India Stack**; a set of open APIs that have enabled the Indian Government to utilize their digital infrastructure. India Stack provides four distinct technological layers: presence-less (universal biometric ID), paperless (digital record), cashless service delivery, and consent (allowing for seamless integration). While India Stack reduces the complexity of many identification and payment processes, it does not solve the challenge of mass distribution and agent locations for the majority of consumers.[34]

Philanthropic capital, such as that from CGAP, has also focused on supporting the development of globally accessible and connected infrastructure as a means to reduce the costs and friction of the technical infrastructure. While many donors invest via partners—such as by supporting the initiatives of CGAP and GSMA—the Bill & Melinda Gates Foundation is also playing a more central role by sponsoring the **Level One Project**, a model for a country-level digital financial service system.

30 GSMA, "State of the Industry Report on Mobile Money: Decade Edition: 2006–2016."
31 Camner, "Launching GSMA Mobile Money APIs to Raise Industry Capabilities."
32 Morawczynski et al., "Digital Rails: How Providers Can Unlock Innovation in DFS Ecosystems Through Open APIs."
33 Lyon and Hanouch, "5 Keys to Addressing the Needs of API Consumers."
34 Raman and Chen, "Should Other Countries Build Their Own India Stack?"

Implications

As the industry focuses on improving ecosystem-level infrastructure, new considerations or challenges will emerge around the application of NGFS. As the technical and operational infrastructures become more holistic, robust, and universal, new discussions are on the rise as a wider array of people and businesses can access or ride the rails of digital financial services. The two most pressing conversations emerging on the global landscape surround privacy and security.

— *Enabling access while managing privacy is a perpetual balancing act for identity infrastructure*

The rise of biometric identity programs enables access to consistently excluded populations. Indeed, biometric identity solutions have been considered the missing link of digital finance,[35] particularly for vulnerable populations.[36] Digital inclusion is at the heart of enabling financial inclusion, but the challenge is whether consumers acknowledge the value of the digital footprint they are sharing with governments and businesses. This dynamic has been a global discussion for a long time, but has lately become more critical in the context of financial inclusion. Underpinning this is the need for a responsible approach to managing data and identity, which institutions and standard-setting bodies are analyzing and promoting.[37]

— *Security will be an ongoing challenge as the technical landscape evolves*

As digital inclusion grows, emerging market dynamics will start to face challenges in managing cybersecurity similar to that faced by the rest of the world. *"The point here is that cybersecurity is becoming increasingly prominent at major gatherings of senior officials… At the very least, it is now clearly accepted that there is now no difference between the digital and physical world: the guns, bullets, bombs and other weapons of yesteryear are now equally kinetic online threats."*[38]

Cybersecurity is key going forward, especially as the industry aims to unlock the opportunity of data-based lending.[39] A solution to managing this challenge will require more attention globally, but particularly for emerging markets which lack supervisory frameworks for online lenders. *"International organizations like the World Bank, the Consultative Group to Assist the Poor (CGAP), the Alliance for Financial Inclusion (AFI), the G20, and groups like Consumer International have all proposed various consumer protection principles which apply to online lenders. While online lenders are still outside of most regulatory and supervisory frameworks in many emerging markets, there are proactive approaches and standards that can be proposed."*[40]

International organizations, such as AFI, are already actively building capacity in this area with specific training to deal with cybersecurity threats: *"As we move towards a more digitally financial included world, financial infrastructures are now more open to cybersecurity threats. Absence of resilient systems and*

35 Chopra et al., "E-KYC and the India Stack – A Transformative Blueprint for Emerging Markets"; O.Hernaes, "You Can't Have Financial Inclusion without Digital Inclusion"; Mondato, "Are biometrics the keys that unlock digital finance's potential?"

36 Birch, "Identity and Inclusion, an Ongoing Case Study."

37 Zook et al., "Ten Simple Rules for Responsible Big Data Research."

38 Saito, "2017: The Year Cybersecurity Went Mainstream."

39 Owens, "What Does Responsible Online and Digital Credit Look Like."

40 Ibid.

frameworks is sure to compromise the financial security of institutions and end users significantly. Regulators and service providers have a role to play in providing solutions and to foster trust amongst end users so that the shift to a cash light economy continues." [41]

41 AFI Global, PPD Training on Cybersecurity Challenges and Resilience Cybersecurity Challenges and Resilience Management," Co-Hosted by AFI PPD Partner, Mastercard,"

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CGAP, June 3, 2017.

3 Morawczynski, Olga, Michel Hanouch, Lesley-Ann Vaughan, and Xavier Faz.
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6 Zook, M., S Barocas, D. Boyd, K. Crawford, E. Keller, and S.P. Gangadharan, A. Goodman, R. Hollander, B. Koenig, J. Metcalf, A. Narayanan, A. Nelson, and F. Pasquale.
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10 Must Reads in this Space

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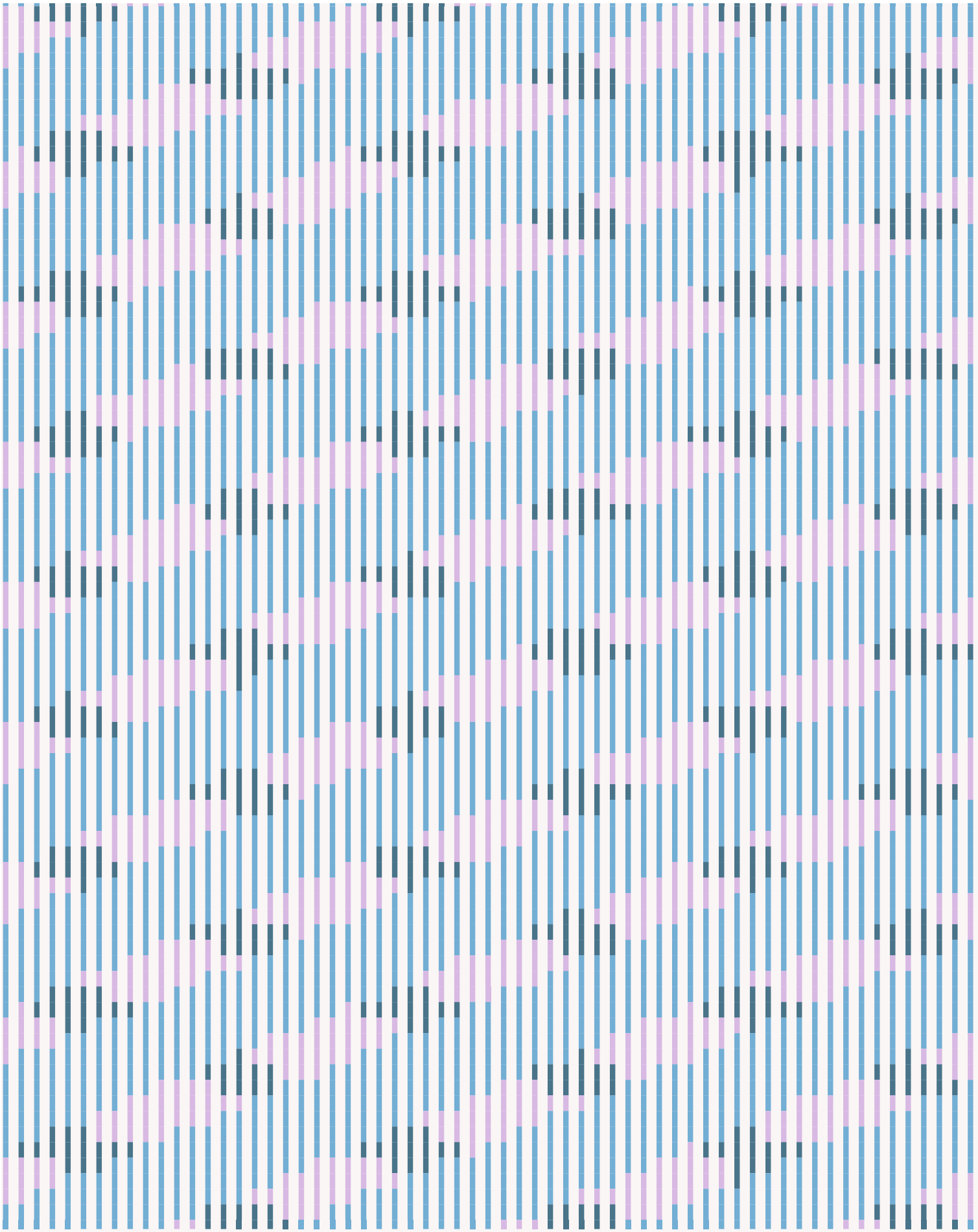

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