



Mezzanine's Stock Visibility Solution

**A mobile solution driving
increased access to medicines**



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mHealth

By forging stronger connections between the mobile and healthcare industries, the GSMA mHealth Programme is supporting commercially sustainable health services that transform the lives of people in need and promote the wellbeing of mothers and families in developing countries.

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ABBREVIATIONS

2G	Second generation (mobile networks)
3G	Third generation (mobile networks)
4G	Fourth generation (mobile networks)
ARV	Antiretroviral
B2B	Business-to-business
B2G	Business-to-government
CHW	Community health worker
CSV	Comma-separated values
HIS	Health information system
HIV	Human immunodeficiency virus
ICT	Information communication and technology
IVR	Interactive voice response
KPI	Key performance indicator
LPV/r	Lopinavir/Ritonavir
MNO	Mobile network operator
MoH	Ministry of Health
NDoH	National Department of Health
NHI	National health insurance
NHLS	National Health Laboratory Service
PoC	Proof of concept
PPP	Public private partnership
SMS	Short message service
SOP	Standard operating procedures
SSA	Sub-Saharan Africa
SVS	Stock Visibility Solution
TB	Tuberculosis
USSD	Unstructured supplementary service data

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Executive summary

In Sub-Saharan Africa (SSA), inefficient supply chain management can lead to stockouts¹ of medicine at public health facilities, complicating the treatment and management of a range of diseases.² Poor and rural communities that depend on these facilities for health services and medicines are most affected. Patients must often make repeated costly trips to health facilities to fill their prescriptions, and when there are stockouts patients default on treatment. Given the high health burden of communicable diseases in SSA, such as HIV (human immunodeficiency virus), malaria and tuberculosis (TB), stockouts are a serious challenge in the region.³

Mobile technology presents an opportunity to address this challenge by enabling access to higher quality healthcare services and reducing the cost of healthcare delivery for governments and private providers. A recent GSMA study showed that mobile operators have an important role to play in digital health.⁴ In this case study, we present the experience of the Vodacom subsidiary, Mezzanine, to demonstrate how the mobile operators can address inefficiencies in the medicine supply chain. This case study describes Mezzanine's broader strategy and portfolio of digital health tools, and demonstrates how the company has leveraged public-private partnerships (PPPs) to provide holistic digital health solutions at national scale.

Mezzanine's Stock Visibility Solution (SVS) enables health facilities to transition from inefficient paper-based stock reporting processes to digital data collection and real-time reporting. SVS reduces stockouts and expands public access to essential medicines, such as antiretroviral (ARV) drugs, TB medications, and vaccines. Since its launch in South Africa in 2014, SVS has been implemented in over 3,500 health facilities in South

Africa, Zambia, and Nigeria. As of June 2018, over 12 million stock level reports have been submitted through SVS. This case study presents some of Mezzanine's key challenges and successes along the SVS journey.

Key insights:

- SVS is reducing the number of stockouts and improving overall stock management at public health facilities.** The total number of stockouts reported in South African provinces that have adopted the SVS solution has decreased significantly. In 2014, in the province of KwaZulu-Natal, stockouts decreased by 46 per cent for ARVs, 49 per cent for TB medicines, and 14 per cent for vaccines. Facilities are also reporting less overstock and less deviation between minimum and maximum available stock levels, both of which can reduce stock losses from expiration.
- Mezzanine's end-to-end platform model offers commercial and operational benefits for its B2B and B2G clients.** Mezzanine's suite of solutions is hosted on its Helium platform,⁵ allowing it to leverage integrated technology functions and share managed services. In addition to its core offering, Mezzanine can also offer additional software applications (security, cloud hosting, analytics, monitoring and reporting) which adds value for clients at no additional cost to Mezzanine.
- Synergies with the MNO allow Mezzanine to strengthen its offering and expand into new markets.** As a Vodacom-owned company, Mezzanine can leverage the brand, infrastructure⁶ and workforce⁷ in Vodacom markets, giving it a competitive advantage over other tech

1. The complete absence of a required drug at a storage point or delivery point for at least one day (WHO, 2006).

2. The World Health Organization (WHO) defines access to medicine as "having medicines continuously available and affordable at health facilities that are within one hour's walk of the population".

3. Health Systems Trust (2014), "South African Health Review 2013/14".

4. GSMA (2017) "Scaling digital health in developing markets".

5. The Helium platform is the technology platform with which all of Mezzanine's products are integrated. It houses the operating system and several loosely coupled technology functions such as the messaging application, payments system, identity management system and data storage, as well as other bushiness and web services.

6. Mezzanine-enabled application server and databases are hosted in Vodacom business data centres that are fully managed and secure, including server monitoring, back-up, failover, and round-the-clock support services.

7. Vodacom sales resources push Mezzanine solutions within its markets. Even in Zambia, a non-Vodacom market, sales agents within AfriConnect (a subsidiary of Vodacom Business Africa) drive uptake of Mezzanine products.

vendors. However, Mezzanine's solutions are network-agnostic and it ultimately aims to build its business beyond Vodacom markets.

- **Securing high-level government buy-in is vital to scaling digital health solutions nationally.**

In South Africa, Mezzanine secured support for SVS directly from the Minister of Health, spurring adoption at national and provincial level. Building champions for the solution at all levels of management within the Ministry of Health (MoH) improves chances of success. Having trusted implementation partners with government ties helps to broker relationships, build trust in a solution, and clarify market objectives. These implementation partners also oversee the change management process, which is crucial to integrating digital health solutions across a health system.

- **Providing evidence of the technical, commercial, and clinical viability of digital health solutions builds the business case for governments.**

Implementing digital solutions in place of

paper-based reporting methods poses a risk for governments,⁸ despite the potential benefits. Providing evidence of both the technical viability and feasibility of a digital solution at scale⁹ and the impact on health outcomes reassures Ministries of Health that the solution works and helps them build the business case for the Treasury to implement the solution at a national level.

- **Aligning key performance indicators (KPIs) of the product with the KPIs of management staff at all levels within the MoH helps to drive adoption.**

The introduction of digital solutions significantly changes work protocols and even staff responsibilities. In South Africa, tailoring SVS web dashboards to meet the monitoring and reporting requirements of managers at health facility, district, provincial and national level ensured relevance of the solution to them driving increased usage.



8. The greatest perceived risks are related to potential loss of data and insufficient back-up protocols and tools in the event of system failure or downtime.

9. In Mezzanine's experience and with specific reference to SVS, government considers implementation in at least 200 health facilities to be sufficient demonstration of the solution at scale.



1. Introduction to Mezzanine

Mezzanine, a subsidiary of Vodacom, was founded in 2009 to provide mobile-enabled solutions for the health, education, and agriculture sectors of Sub-Saharan Africa. The company is currently operating in South Africa, Kenya, Tanzania, Zambia, Mozambique,

and Nigeria. Mezzanine solutions are offered to businesses and governments as managed services to cut costs, increase efficiency, and enable companies to do business in Africa without the complexities of setting up and managing technology infrastructure.

1.1. Mezzanine's digital health portfolio

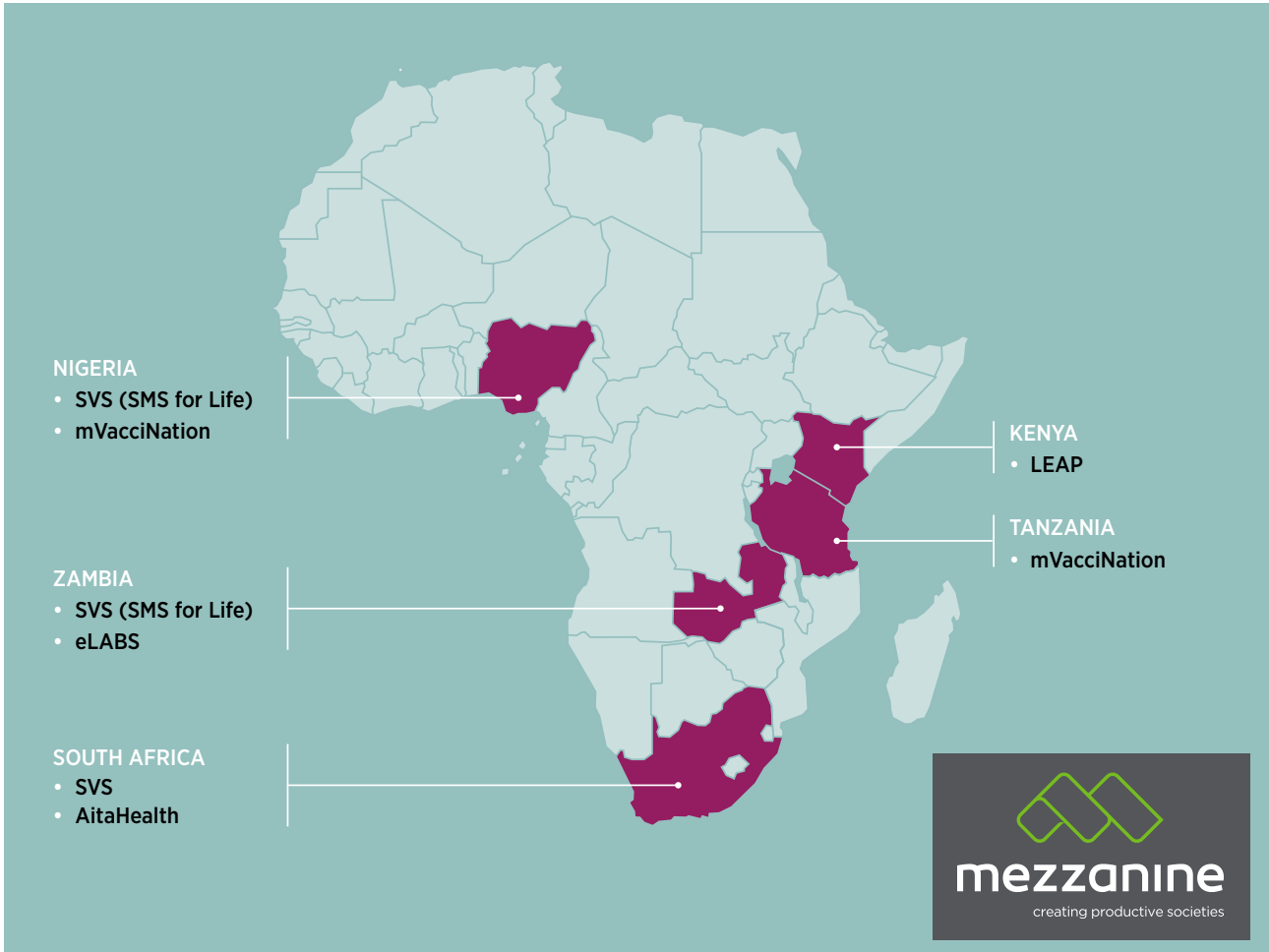
In the digital health ecosystem, Mezzanine has a suite of five tools for community health services, health worker education, vaccination tracking, and stock management. These tools are currently deployed across five countries in SSA (see Figure 1).

- **SVS**, inspired by the SMS for Life programme supported by Novartis, is being used in over 3,000 healthcare facilities in South Africa, Zambia, and Nigeria.¹⁰ With SVS, dispensing facilities can record weekly stock levels using a smartphone and application bundle. SVS is synchronised in real time to a cloud-hosted server that automates alerts and reports for managers at various levels of the supply chain. To date, over 12 million stock update transactions have been made on the SVS platform.
- **mVacciNation** is a mobile-enabled solution available in Tanzania and Nigeria to support primary health service providers with their immunisation programme. The solution tracks vaccination schedules for every child who has been immunised, sending reminders of their next vaccination, and forecasts the availability and potential of stockouts of vaccines. The solution also enables cold chain monitoring.
- **AitaHealth** is a smartphone-based application that empowers around 2,000 community health workers (CHW) in South Africa to collect key data on health indicators for the National Department of Health (NDoH), while also providing administrative and clinical decision-making support in real time.
- **LEAP** is a mobile learning solution that health departments use to train CHWs and empower and support them to provide health-related services in their communities. LEAP has been deployed in Kenya, where over 30,000 CHWs have been trained through the application as of June 2018.
- **eLABS** is a mobile application that tracks and sends results of blood specimens electronically. To date, it has been deployed in 71 health facilities in Zambia. By enabling effective sample location tracking as well as temperature monitoring, eLABS has reduced the number of samples lost and lowered sample rejection rates at laboratories. Patients also benefit from shorter waiting times for test results compared to paper-based methods.

10. SVS is branded as 'SMS for Life' in Zambia and Nigeria.

FIGURE 1

Mezzanine's digital health solutions deployed across SSA



This case study focuses on the Stock Visibility Solution (SVS), one of several mobile health products developed by Mezzanine. While the path to implementation has not been trouble-free, SVS has achieved considerable scale in several markets thanks to strong government

interest and, in some cases, government ownership and financing. Integration of SVS in national health systems has helped local governments improve the supply of essential medicines at health facilities.

2. The role of digital health in addressing healthcare challenges

2.1. The health burden in SSA

SSA continues to bear a significant health burden, with communicable diseases accounting for seven of the top 10 causes of death.¹¹ HIV, malaria, and TB account for much of the burden. An estimated 25.5 million people are living with HIV in SSA,¹² 12.2 million of whom are receiving ARV care. Over 50 per cent of HIV patients are co-infected with TB, and SSA accounts for 29 per cent of the global TB burden.¹³

When inefficient supply chain management results in stockouts¹⁴ of essential medicines at health facilities, it becomes complicated to treat and manage communicable diseases.¹⁵ Despite sufficient inventory at national warehouses, up to 30 per cent of health facilities in some SSA markets reported stockouts of certain medicines.¹⁶ In South Africa, stockouts of TB

medication and ARVs at health facilities rose from 25 per cent in 2014 to 36 per cent in 2015, and 70 per cent of reported stockouts lasted for over a month.¹⁷

Poor and rural communities that depend on these facilities for health services and medicines are most affected. Patients must often make repeated costly trips to health facilities to fill their prescriptions, and when their medicine is not available they default on treatment, creating a higher risk of infection and, ultimately, an increase in morbidity and mortality.¹⁸ Stockouts also mean that an already strained health workforce spends time rationing or tracking drugs instead of caring for patients.¹⁹

11. WHO, Global Health Observatory (GHO) data, Africa Region, [Top 10 causes of death](#), 2016.

12. UNAIDS (2016) ["Global AIDS Update 2016"](#).

13. International Journal of Infectious Diseases (2015), ["Tackling the Tuberculosis Epidemic in sub-Saharan Africa"](#).

14. The complete absence of a required drug at a storage point or delivery point for at least one day (WHO, 2006).

15. The WHO defines access to medicine as "having medicines continuously available and affordable at health facilities that are within one hour's walk of the population".

16. ResearchGate (2016), ["The Impact of Inventory Management on Stock-Outs of Essential Drugs in Sub-Saharan Africa"](#).

17. Stop Stock Outs Project, ["2015 Stock Outs National Survey: Third Annual Report, South Africa"](#).

18. Health Systems Trust (2014), ["South African Health Review 2013/14"](#).

19. Stop Stock Outs Project, ["2015 Stock Outs National Survey: Third Annual Report, South Africa"](#).

2.2. The digital health opportunity

The number of mobile broadband connections in SSA will reach 500 million by 2020, more than double the number at the end of 2016.²⁰ This will account for two-thirds of all mobile connections in the region, with 3G remaining the dominant mobile broadband technology. Network expansion, increased availability and affordability of smartphones, and more affordable data tariffs will all help to drive this growth in consumption of broadband services.

With more widespread adoption of mobile broadband and more capable devices, mobile is well positioned to solve complex health system challenges. There are 26 countries in SSA with some form of electronic health (eHealth) or health information system (HIS) policy or strategy in place, providing an opportunity

to rollout mobile technology to strengthen healthcare systems.²¹ All five of the countries where Mezzanine has rolled out its digital health solutions have eHealth policies in place, creating an enabling environment for services like SVS to be adopted.

With proper training of users to overcome low technical literacy and simple, well-designed user interfaces, mobile apps can be used by frontline health workers to provide healthcare services that have been challenging to deliver in the past.²² However, these services will need to be able to function offline to support adoption even in areas with poor connectivity. At the same time, mHealth information services for patients will need to continue to support basic 2G technology channels.²³



20. GSMA (2017), "[The Mobile Economy. Sub-Saharan Africa 2017](#)".

21. WHO, [Global Observatory for eHealth](#).

22. GSMA (2018), "[Living Goods Uganda: A community health service leveraging mobile technology](#)".

23. All the mHealth services under the mNutrition initiative supported by the GSMA delivered information to users via basic 2G channels, such as short message service (SMS), unstructured supplementary service data (USSD) and interactive voice response (IVR).

3. Mezzanine's business model

Mezzanine licenses digital health solutions to businesses (B2B) or governments (B2G). In South Africa, SVS is an example of a fully scaled B2G service financed directly by the NDoH. Mezzanine's eLABS deployment in South Africa is an example of a quasi-public model whereby the government pays indirectly for the service through Mezzanine's client, the National Health Laboratory Service (NHLS).²⁴



By estimating the cost of full-scale implementation (for example, deployment of SVS in all health facilities nationally), Mezzanine claims it can offer clients (businesses or governments) competitive rates for small-scale implementation during the proof of concept (PoC) phase, and break even in five to ten years provided the solutions have scaled. To mitigate this risk and increase the business potential of each product, Mezzanine prioritises digital health tools that are relevant and easy to replicate in all SSA markets.

Mezzanine's preferred strategy is to develop modular digital health solutions, prioritising high-value services for the client that are incremental innovations rather than disruptive. At the same time, technical

functionality is continuously expanded by adding new product modules or enabling integration with more upstream and downstream systems and services.

Adopting a platform model approach has allowed Mezzanine to develop integrated holistic solutions hosted on its Helium platform. By using an existing technology platform²⁵ and shared managed services,²⁶ Mezzanine's clients have seen both commercial and operational benefits. It can also offer additional software applications (security, cloud hosting, analytics, monitoring and reporting) as a complement to its core offering, adding value for clients at virtually no additional cost to Mezzanine.

24. The NHLS is a state owned health laboratory service consisting of a network of 265 laboratories in all nine provinces that service all public hospitals and clinics in the country.

25. Managing communication, data, information, identity, security and transactions.

26. Training, change management, maintenance, and user and technical support.






3.1. Public-private partnerships

Mezzanine's digital health strategy relies on multi-stakeholder, cross-sector partnerships. Public-private partnerships (PPPs) are key to delivering impactful and sustainable digital health solutions at scale, as individual stakeholders do not have sufficient capacity or resources to do so on their own.²⁷ Mezzanine also highlights the need for a trusted third party to help broker relationships with governments, establish trust, and clarify market objectives. These partners oversee the change management process necessary

for successful integration of digital health tools in the health system. In exchange, Mezzanine's model of providing a turnkey managed service makes it easier for implementing partners to focus on their core business or function, while Mezzanine deploys and maintains the technical component and manages the relationship with the network provider. The role of various organisations within the SVS PPP network are detailed in Table 1.

TABLE 1

The roles of various organisations within the SVS PPP network

	Technology partner 	MNO 	Ministry of Health 	Funding partner 	Implementation partner 
SOUTH AFRICA	Mezzanine provides the digital tools and end-to-end managed service that includes training, technical support and connectivity bundle management	Vodacom provides connectivity, first line technical support (helpdesk) and mobile devices	NDoH has assumed full ownership and financing of SVS	Vodacom Foundation funded the PoC phase of SVS	The Supply Chain Technical Assistance unit within the NDoH are responsible for operational management of SVS
ZAMBIA		AfriConnect (subsidiary of Vodacom Business Africa) provides connectivity	Ministries of Health of the Northern Province, Muchinga Province and Luapula Province are engaged in the PoC of SVS	Novartis Foundation for People and the Environment is funding the first phase of SVS	Right to Care are responsible for operational management of SVS
NIGERIA		Network agnostic: 9Mobile, MTN and Airtel provide connectivity	Kaduna state MoH are engaged in the SVS PoC		Novartis Social Business is supporting the SMS for Life training GlaxoSmithKline and Adam Smith International are responsible for implementation of mVacciNation ²⁸

27. GSMA (2018) "Creating mobile health solutions for behaviour change: A study of eight services in the mNutrition Initiative portfolio".

28. In Nigeria SVS and mVacciNation are planned to be integrated with each other.

3.2. Vodacom's role

As a subsidiary of Vodacom, Mezzanine operates independently. As a smaller, specialised enterprise solution provider, Mezzanine can take on greater risk and adopt a more agile approach to product development. In Vodacom markets, Mezzanine can use the Vodacom brand, infrastructure,²⁹ and workforce³⁰ to gain competitive advantage over other mHealth tech vendors.

As a major shareholder, Vodacom benefits from expanding into non-traditional markets and sectors. As Mezzanine develops successful products across several markets, there is the potential for Vodacom to integrate these more formally into its portfolio of enterprise products and services and to leverage its enterprise channels to reach greater scale.

3.3. Donor funding

Some of Mezzanine's digital health tools are supported by seed funding from donors in the PoC phase to demonstrate the viability of its health solutions and attract financing from other clients, such as governments. For example, Novartis is funding the first phase of SVS implementation, branded as SMS for Life in Zambia and Nigeria as part of an effort to encourage more government stewardship and leadership in digital health solutions. Its objective

is to fully integrate SMS for Life into national health systems and enable full ownership by Ministries of Health. In Nigeria, the government has expressed interest in the SVS solution, but requires proof of viability for large-scale implementation (in at least 200 health facilities). Mezzanine's other funding partners have included the Vodacom Foundation (SVS, South Africa), the Foundation for Professional Development (AitaHealth, South Africa), and AMREF (LEAP, Kenya).

29. Mezzanine-enabled application server and databases are hosted in Vodacom business data centres that are fully managed and secure, including server monitoring, back-up, failover and round-the-clock support services.

30. Vodacom sales resources push Mezzanine solutions within their markets. Even in Zambia, a non-Vodacom market, sales agents within AfriConnect (a subsidiary of Vodacom Business Africa) drive uptake of Mezzanine products.

3.4. Government engagement

Mezzanine has been operating in the digital health space since 2009 and has had some success engaging with governments. Today, the main challenge for Mezzanine is promoting government ownership of digital health solutions, due to a lack of resources and low propensity to innovate through technology in the public sector. To stimulate and facilitate government engagement, Mezzanine has introduced several initiatives:

- **Securing high-level government buy-in to scale digital health solutions nationally.** In South Africa, Mezzanine secured support for SVS directly from the Minister of Health, spurring adoption at national and provincial level. Identifying and building relationships with champions at all levels of management improves the chances of success. With high staff turnover in government health departments, it is vital that managers at all levels understand the benefits of the digital solution and are invested in it. This has been critical to drumming up much-needed support during implementation.
- **Aligning product KPIs with the KPIs of management staff at all levels within the MoH helps to drive adoption.** The introduction of digital solutions significantly changes work protocols and even staff responsibilities. In South Africa, tailoring SVS web dashboards to meet the monitoring and reporting requirements of managers at health facility, district, provincial and national level ensured relevance of the solution to them driving increased usage.
- **Aligning cost modelling with MoH remuneration strategies and budget allocation for existing systems and processes makes it easier for them to assess value for money.** Understanding how new budget is allocated for digital solutions also helps to position the product appropriately. This can be a challenging and lengthy process for solution providers. In most cases, Ministries of Health cover more of the costs of a digital health solution incrementally.
- **Providing evidence of the technical, commercial, and clinical viability of solutions at scale builds the business case for digital health solutions.** Governments in SSA consider it a risk to implement digital tools in place of paper-based methods, despite the potential benefits of the solutions. Providing evidence that the tool is technically viable and feasible at scale (at least 200 facilities in the case of SVS), and that it is having an impact on health outcomes, helps Ministries of Health build the business case for national implementation to the Treasury.
- **Actively engaging with government throughout the PoC phase supports full integration in the health system.** Engaging with MoH staff at quarterly workshops and encouraging them to take the lead in decision making bolsters their interest in the digital solution and paves the way to full integration in the health system and government ownership and financing.

4. Stock Visibility Solution

4.1. Overview

SVS is a mobile-based tool designed to improve stock management at health facilities, thereby increasing availability or access to essential medicines³¹ and improving treatment outcomes for patients in populations in need. A free disease surveillance module allows dispensing facilities to track cases of malaria, HIV, TB, and other notifiable diseases.³²

SVS, inspired by the SMS for Life programme supported by Novartis, was first piloted in 2014 in 605 public health centres (PHCs) across the South African province of KwaZulu-Natal. In 2015, the pilot

was extended to the provinces of Limpopo (478 health facilities) and Eastern Cape (750 health facilities). Following a successful pilot, in 2016 the NDoH assumed ownership (operational management and financing) of the solution and rolled it out nationally in five more provinces,³³ bringing the SVS health facility count to over 3,100. In Nigeria in December 2016, phase one of SVS implementation was launched in 251 health facilities in Kaduna State. It was rolled out in Zambia in December 2017, and by May 2018, the solution had been deployed in 144 facilities across Northern Province, Muchinga Province, and Luapula Province.



31. For example, antiretroviral drugs for the treatment of HIV, TB drugs, and vaccines. The disease surveillance module is currently in use in Zambia and was developed in response to the Zambian MoH's need to track and monitor disease prevalence more effectively.

32. Such as cholera, measles, viral haemorrhagic fever, yellow fever, acute flaccid paralysis (suspected poliomyelitis), as well as inpatient infant and maternal deaths.

33. Eastern Cape, Free State, Mpumalanga, Gauteng, North West, and the Northern Cape. The Western Cape is the only province that already had a stock management solution in place and therefore did not adopt SVS.

4.2. Service design

FIGURE 2

The SVS workflow



The SVS mobile app enables health facility staff (nurses or dispensary stock managers) to record stock levels and disease instances on a weekly basis (see the SVS workflow in Figure 2). When completing a stock level report, these users can either scan the barcodes of each stock item³⁴ in the stock room (as shown in Figure 3), select stock items from the facility formulary list³⁵ on the app, or scroll through

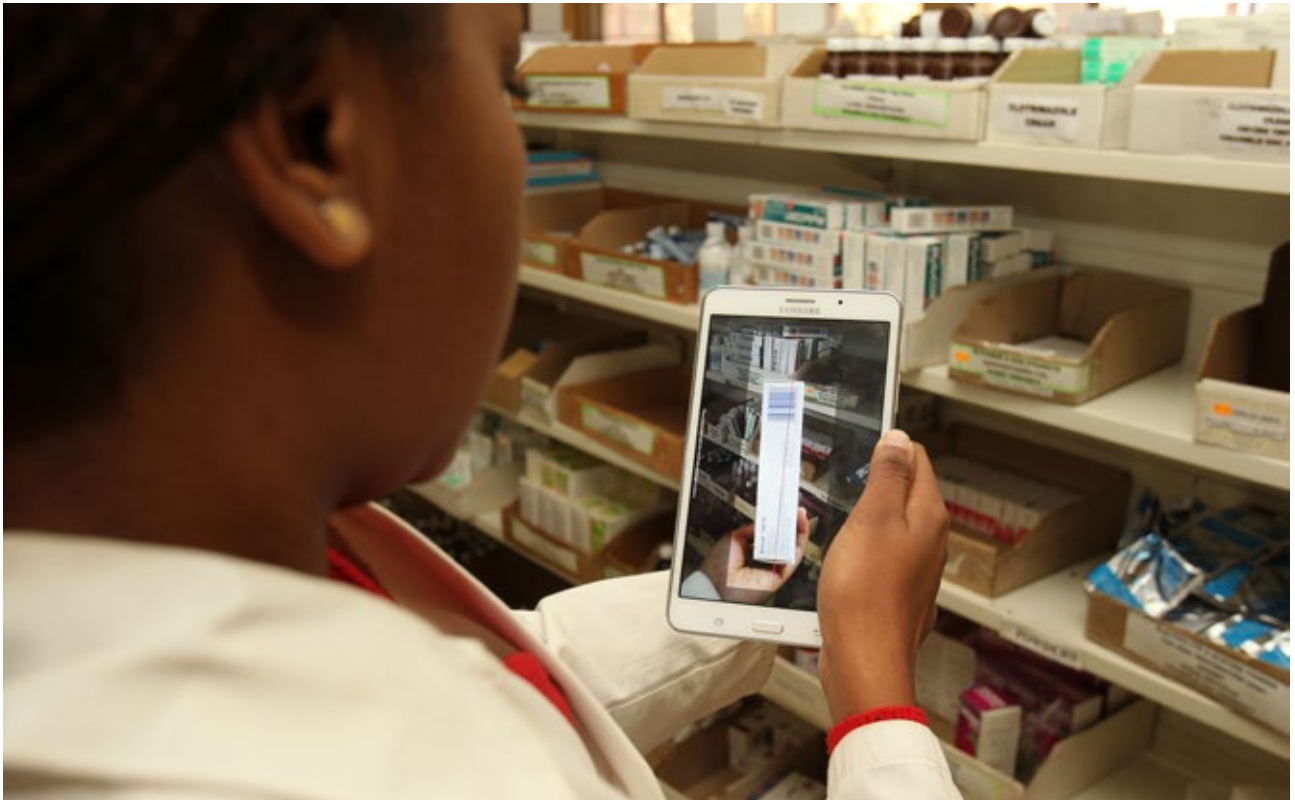
all available stock items on the app. For each stock item, users report the current stock level (number of units), the expiry date, stock received (number of units), and number of units lost (due to expiration) since the last stock update. For disease surveillance reporting, users select diseases from a list and record the number of reported cases by per patient age group since the last disease surveillance report.

34. A stock item refers to a particular medication of specific strength (mg/ml) and quantity (number of tablets).

35. The formulary is a list of essential medicines that are supposed to be stocked at each health facility.

FIGURE 3

An SVS health facility staff user scans the barcode of a stock item as part of her weekly stock level reporting



Once stock levels and disease surveillance reports are submitted, this information synchronises securely and in real time with a cloud-hosted server that automates alerts and web-based reporting for management staff (the second SVS user group). Alerts are sent to health facility and district-level managers to notify them of low and no-stock levels for immediate attention. Data from SVS is integrated into upstream electronic stock management systems, allowing hospital and district pharmacy managers to

order the required stock. Managers can also access web- or app-based monitoring dashboards that are tailored to their needs and monitor KPIs³⁶ at the appropriate degree of granularity (health facility, district, provincial, and national level). Data is visualised using graphs and heat maps (see Figure 4) and managers can toggle between different views (by KPI or disease category). In addition to automatically generated monthly e-mail reporting, managers can export configured reports in various formats.

36. An example of a stock level KPI is medicine availability, which is a percentage calculated as the number of stock items with confirmed stock availability over the total number of stock items on the facility formulary. This can also be segmented by disease category. Other examples of stock-related KPIs would be top out-of-stock items, facilities failing to report, or facilities reporting repeat out-of-stocks.

FIGURE 4

Demo dashboard showing stockout levels (generated with random data)



Digitising paper-based reporting of stock levels and disease instances benefits both user groups, health facility staff and management level staff. Built-in intelligent workflow and decision support functions on the SVS mobile app guides health facility staff users through the reporting process, speeding data entry and saving them time. The app also allows these users to validate data fields and monitor whether all the compulsory data fields have been populated. Users are also queried for any out-of-bound (unrealistic) entries to ensure the quality and integrity of the data – often a challenge with paper-based reporting.

Better visibility of stock levels at health facilities has enabled governments to move from a pull model to a more informed push model, as Ministries of Health can proactively replenish stock levels while repeat out-of-stock facilities can be identified and prioritised for attention. Similarly, real-time data on disease prevalence allows district, provincial, and national level management staff SVS users to make informed and timely decisions, target interventions, and allocate resources appropriately for effective disease management and prevention.

4.3. Results and impact

Mezzanine tracks several KPIs related to SVS use, for example, frequency of use at facilities. In South Africa, 95 per cent of facilities use the SVS application to report data on a weekly basis. Since launch in 2014, over 11 million stock level updates have been submitted on SVS. In Nigeria, 90 facilities identified as priority targets are all using SVS (branded as SMS for Life in Zambia and Nigeria, as it is supported by the Novartis Social Business) to report weekly stock levels and disease instances and since its launch in December 2016, over 65,000 disease surveillance reports and 410,000 stock level reports have been

submitted. SMS for Life has been used in Zambia since December 2017, where 6,300 stock updates and 8,400 updates on disease instances have been recorded.

Mezzanine also tracks managers' web platform use over time, monitoring the frequency of use and the number of hits on various reports to determine their preferences. In South Africa, the data produced by SVS is reviewed weekly by 358 managers at all levels of the NDoH. In Nigeria, 370 managers are using the web-based dashboards every week.

FIGURE 5

A health facility supervisor views the SVS web dashboard



There is growing evidence of the positive impact of SVS on the management of the medicine supply chain. During the SVS pilot in South Africa, the overall number of stockouts reported in KwaZulu-Natal in 2014 decreased by 46 per cent for ARVs, 49 per cent for TB medicines, and 14 per cent for vaccines. Similarly, in Limpopo, the overall decrease in reported stockouts in 2015 was 66 per cent for ARVs, 49 per cent for TB medicines, and 42 per cent for vaccines.³⁷ In Nigeria, an analysis of stock updates that included a reported stockout showed early signs that the number of reported stockouts between April 2017 and April 2018 had declined.

SVS is also helping health facilities to maintain more consistent stock levels. In Nigeria, facilities making frequent (weekly) stock updates are reporting less overstock and less deviation between the minimum and maximum levels of stock on hand. This improvement can enable more accurate demand forecasting and, therefore, more appropriate supply of medications. Reducing overstock in some facilities invariably reduces understock in others, while reducing stock loss due to expiration leads to potential cost savings for government in the long term.

4.4. SVS business model

Following a successful pilot in South Africa (for which Vodacom Foundation provided the seed funding), SVS has become a nationwide B2G tool paid for by the NDoH. The mobile solution is licensed to the government and the fee is a fixed monthly rate based on the number of facilities using the solution. Clients also pay a one-time fee for hardware (one smartphone and SIM card per health facility and 10 per cent buffer stock) and a training fee (train-the-trainers approach with two sessions per facility). When requested by the client, Mezzanine also provides additional training and change management support at an additional cost.

As part of its end-to-end managed service, Mezzanine offers:

- Reverse billed zero-rated data channels;³⁸
- Weekly and monthly reminder and escalation messages (maximum of 10 per user);

- A user registration and enrolment service;
- Hosted application environment as a managed service;³⁹
- Software as a service (mobile phone and web application); and
- Support to all users based on a service-level agreement.

SVS is relatively easy to replicate across borders because the protocols for managing medicine supply chains, and the associated challenges, are relatively similar in different provinces and even across different markets. The majority of setup costs in a new market are for business development, understanding new work flows, and change management. These costs are typically covered by seed funding.

37. Dr. Aaron Motsoaledi, Minister of Health (2016) SVS press release.

38. Mobile application services are hosted behind a reverse-billed zero-rated IP address and are accessible even if the user has a zero balance on their mobile phone. When using the application, the end user incurs no data charges.

39. The mobile and web management application and data are hosted in the Vodacom data centre. Only authorised staff members given access by the system administrator have access to the database.

4.5. Service evolution

When South Africa's NDoH decided to assume ownership of the SVS solution, tight timelines were set for national rollout. Within four months, the number of SVS implementation facilities grew from around 1,800 to 3,100. This rapid expansion brought several challenges, mainly related to user onboarding. Poor change management and hurried training resulted in low levels of adoption, requiring the costly exercise of retraining many managers.

For SVS users in South Africa, the absence of clear governance structures created confusion and did not promote the sense of ownership so critical to the success of digital health tools. One of the main reasons for this was that nurses using the SVS app reported to the primary healthcare (PHC) unit while SVS was managed by a separate pharmaceutical services unit as part of the Affordable Medicines Directive. Initially there was a lack of communication between the two units and priorities were not aligned. Engaging with PHC managers on the benefits of SVS and creating a better understanding of the processes and challenges involved in managing the medicine supply chain helped to overcome this challenge. It was also discovered that standardised reporting was not meeting the monitoring and reporting requirements of the PHC managers and that customised dashboards were needed instead.

Mezzanine found that a lack of standard operating procedures (SOP) meant that some managers who received low- or no-stock notifications for facilities did not know how to respond initially. There was also a lack of policies on device management to guide staff who were completing the formulary lists for their health facility, which led to high rates of device loss. Staff took better care of the devices when they understood they were assets of the NDoH and that there were consequences for losing a device. It also became clear that formulary lists needed to be

configured to each health facility as SVS users were doing stock reports for all items on the formulary list in the app, even those that were not dispensed at their facility. This resulted in a high number of incorrectly reported stockouts. Formulary lists on the app are now specific to each facility and they can be updated centrally by management in real time.

In light of these challenges, Mezzanine is working on improvements to SVS. Future iterations of the solution will see the addition of several new features:

- **Automated reordering:** In its current design, SVS is fully integrated with existing upstream stock-ordering software used by Ministries of Health. Stock level data is synchronised with these software solutions, which allows management to order new stock. The vision for SVS is to enable automatic reordering when stock levels at facilities reach certain thresholds.⁴⁰
- **Confirmation of stock received:** Since there can be discrepancies at facilities between stock ordered and actual stock levels, the NDoH is identifying whether stock loss is happening before or after it is delivered to the health facility. To address this issue, Mezzanine is introducing a module that facilitates a count of stock received.
- **Automatic synchronisation with the national Essential Medicine List:** Currently, the national list of essential medicines to be stocked at health facilities is managed on a CSV text file that is manually uploaded by Mezzanine to the SVS system every quarter. However, Mezzanine plans to integrate and synchronise the master list of medicines in SVS with the national list (a separate app).

40. These can be determined by predicting demand based on historic dispensary data.

A recent evaluation in South Africa revealed additional areas of improvement for the solution:

- **Clear communication with users.** The introduction of digital health tools can significantly change work protocols and even job responsibilities. Clear communication is vital to the success of digital health initiatives, and implementing organisations such as Ministries of Health should help to clarify misunderstandings and manage expectations to help stakeholders adapt to the new solution and support processes that will help them be successful.



“I have never seen the organogram and roles and responsibilities or SOP.. they never communicated that I should be part of it. But somebody should hold me accountable to say that according to this role, this is what you are expected to do.”

– Management-level SVS user

- **Sufficient staff capacity planning and training:** Once the benefits of SVS have been clearly communicated, implementing organisations need a stronger and more systematic on-boarding and change management process to address staff’s natural resistance to change and get buy-in from users. Long-term planning for staff capacity is critical to ensure support is available and responsibilities are clearly assigned.



“We need more standardised training, like for instance people will be hired, maybe other people will be leaving, so someone will just come in and do whatever they think is right instead of what needs to be done... so that we can transfer the skill [to other staff]... I think there should be a refresher training.”

– Health facility-based SVS user

- **Adoption and trust of SVS beyond health facilities:** To further entrench the benefits of SVS and even improve work flows and processes, Ministries of Health and other implementing partners need to ensure the service is fully adopted by stakeholders at all levels and up and down the supply chain.



Spotlight

Driving adoption among users

Successful implementation of digital health tools for governments depends on users adopting them all along the work flow — from those providing the inputs (health facility staff who capture stock data) to those using the outputs (managers who use the data for reporting). The challenge for SVS, and most new digital health tools, is that users are required to use them in parallel with existing work protocols. In the case of SVS, some users saw it as added workload, even though it was substituting cumbersome paper-based processes with more agile digital ones. This perceived added burden on users can often result in low rates of usage.

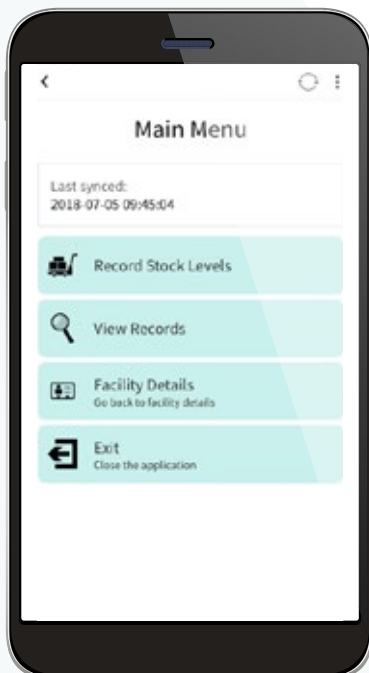


“So here was a new device and a new system that added on to the current workload of our extremely short-staffed personnel at the facilities and I was saying to them, ‘Listen, whilst you’re doing all of this, I want you to take out three or four hours of your time during the week to capture information’. We did experience a lot of resistance with regard to the Stock Visibility Solution.”

– Health facility supervisor

FIGURE 6

The SVS app user interface



To increase the likelihood that users will use SVS as required, Mezzanine adopted user-centred design approaches that provided pleasant and smooth user experiences. One of the findings from a recent evaluation of SVS in South Africa was that users feel the mobile application is simple, straightforward, and easy to use. Most participants in focus group discussions reported that using SVS was faster than the manual process and it made them feel motivated.⁴¹

41. Data Innovator (2017) “Evaluation of Stock Visibility Solution Implementation in Umzinyathi and Amajuba Districts in Kwa-Zulu Natal”.



At the management level, adoption depends heavily on the usability and customisability of dashboard reports and, more importantly, the outcomes of decisions made based on the reports. The outcomes of a digital solution, such as the impact on stock levels, are typically the single most important influence on whether management will adopt it.



“The NDoH contract managers were able to utilise LPV/r medicine availability data for Limpopo and KwaZulu-Natal provinces collected through SVS to manage the LPV/r supply interruptions and minimise the impact thereof on patients.”

– Ivan Pillay, Director General, South Africa NDoH



“The system essentially provides scientifically sound information based upon which appropriate action can be taken. Similarly, the system notifies managers of over-stocking situations which are known to lead to stock loss due to expiry. Managers are thus able to take action in order to prevent stock-outs and excessive loss of stock from occurring in the first place...This has now enabled us to ensure national-level oversight of medicine availability in all nine provinces as SVS and Western Cape medicine availability data can be pulled into a central PHC dashboard which forms part of the National Surveillance Centre.”

– Dr Aaron Motsoaledi, South African Minister of Health



5. Mezzanine's digital health roadmap and considerations for the industry

Mezzanine's PPP model, government engagement strategy and client- and user-centered product development approach have been foundational to the success of SVS and its other mobile health products. Mezzanine has demonstrated how MNOs like Vodacom can remain relevant in the digital health space and strengthen their role as ICT and digital service partners for governments and health providers. The continued expansion of SVS and Mezzanine's other digital health products demonstrates the growing B2G and B2B opportunity that digital health presents for MNOs and other digital health companies.

Mezzanine is prioritizing the expansion of its digital health portfolio on several fronts:

1) Achieve national scale in current markets and implement solutions in new markets

Mezzanine is actively assessing the opportunity to launch its digital health tools in new markets while also expanding reach in existing markets. Mezzanine aims to scale SVS nationally in Zambia and Nigeria following the PoC phase and to take the solution to other markets in SSA. The first phase of Mezzanine's laboratory results dissemination system, eLABS, will be launched in South Africa's Gauteng Province in Q3 2018.

2) Grow value proposition of digital health products through flexible, modular solutions

Mezzanine plans to develop more holistic solutions that address increasingly more health systems challenges, by expanding product functionality. SVS's modular design allows for new synergistic functions to be added to the core product as demonstrated by the addition of the disease surveillance module. Alternatively, SVS can be integrated with solutions like Mezzanine's mVacciNation, expanding its value offering to provide accurate supply of vaccinations and increased support to nurses and caretakers of children receiving vaccinations as well as improved cold chain monitoring. The first market prioritised for the integrated SVS-mVacciNation solution is Nigeria, with other markets to follow.

3) Ensure interoperability and data integration with other digital solutions within national healthcare systems

The experience of Mezzanine shows that full integration with national healthcare systems is fundamental to the success of digital health initiatives. In South Africa, SVS is integrated with the national healthcare system, allowing data from SVS to feed into upstream software systems (for example, stock-ordering software used by Ministries of Health). This integration presents opportunities to implement new digital health solutions alongside SVS. For example, in South Africa the introduction of the national health insurance (NHI), implemented through a patient outcome-based remuneration system, has spurred the need for greater visibility into services and medications delivered to the patient. The NDoH intends to implement a digital solution to track medicines into patient hands, enabling better visibility into what stock is being dispensed from the facility and when, as well as prescription tracking. There is potential to use SVS for this function.

By building the evidence base on the benefits of its digital health products Mezzanine hopes to strengthen the business case for its products and services, for not only government, but also private healthcare providers. The South African NDoH has been financing the national implementation of SVS under the National Health Insurance budget. However, a full economic assessment to quantify the value of the solution to local governments must be undertaken in order to have the provincial health departments include SVS in their budget. There is still a need to define the necessary proof points but they will include the benefits for:

- **The public:** time and cost savings, and health outcomes achieved from better access to medicine at health facilities;
- **Health facilities and management-level staff:** time savings and higher productivity due to new efficiencies; and
- **The broader public health system:** cost savings from reduced stock loss to expiration and perhaps even from a reduced disease burden.

SVS and other Mezzanine digital health products are scalable globally, beyond the Vodacom footprint.

A growing demand from governments for health systems strengthening solutions like SVS that cut across several health verticals⁴² is essential for a long-term adoption of digital health tools and services. This would stimulate a competitive supply of commercial products that come with a roadmap for ongoing evolution. Donors will play a crucial role by providing seed funding for solutions that span across multiple health use-cases, with the aim of demonstrating PoC for future ownership by governments.

42. SVS improves access to essential medicines for several communicable diseases including, but not limited to, HIV, TB and Malaria.





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