



VRITTI

THE DIGITAL FINANCIAL SERVICES GUIDE

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Blurb

Dear readers,

Digital wallets have transformed the financial service industry globally by providing real-time, convenient and seamless payments to consumers. Consequently, digital wallets have seen mass adoption across the world. According to Juniper Research, there were 2.6 billion unique digital wallet users globally in 2020, which will increase to 4.4 billion by 2025. In this Edition of Vritti, we will **celebrate the success of digital wallets** through four interesting articles.

In our first article '**Digital Wallets: Transcending the Inflection Point**', we bring together digital wallet CXOs from 3 continents – Africa, Latin America and Asia – and listen to their views on the growth and future of digital wallets.

Next, we discover how digital wallet providers are moving beyond basic payment use cases to more sophisticated investment use cases such as stock trading, crypto asset trading and gold trading in the article '**Digital Wallets: From Financial Inclusion to Financial Enrichment**'

Further, we go to Africa to see the market potential for the growth of digital wallets in seven African countries in the article 'Digital Payments Revolution in Sub-Saharan Africa'.

Lastly, in the article '**An Insight into Performance Engineering**', we talk to a digital wallet tech developer on how adding performance engineering stage in the software development life cycle can help to deliver a better digital wallet solution.

I hope you like reading these articles, as much as we loved creating them.

Happy Reading!

DIGITAL WALLET: TRANSCENDING THE INFLECTION POINT



To discuss the **role of digital wallets and their role in boosting a digital economy**, Comviva, in association with YourStory, hosted a CXO discussion on 'Digital Wallets: Transcending the Inflection Point'. The discussion brought together global fintech leaders from three continents including



Eddie Chibi
CEO, Cassava Smartech
Zimbabwe



Hernando Rubio
Founder and CEO
Movii, Colombia

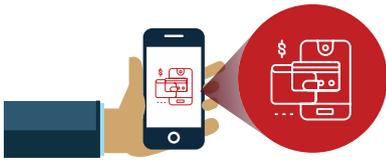


Sarath Chandra
CIO, Airtel Payments Bank
India



Srinivas Nidugondi
Chief Growth and Transformation
Officer, Comviva, India

Following are the excerpt from this interesting discussion.



Democratising access to digital wallets

Talking about the growth of digital wallet users in Latin America, Hernando from Movii said that since the last few years, the number of Latin Americans with access to financial services has grown exponentially. "The business model we have right now is not right and there's a huge opportunity for entrepreneurs to change that. We also have a big percentage of inequality, one of the reasons being the lack of financial services. With the penetration of internet services and smartphones, even the poor have shifted to digital platforms for communication, so why not payments? We can use technology to democratise that," he said.

In Zimbabwe, 90 percent of the adult population uses EcoCash — a mobile phone-based money transfer, financing and microfinancing service. Speaking about how they managed to achieve this growth, Eddie said that the penetration of mobile phones, which was below 50 percent back then, is what encouraged them to easily adopt such financial services.

"To create a digital ecosystem, you can either compete or collaborate with ecosystem partners," he said.

EcoCash integrated with banks, remittance partners and payroll processing companies to digitise financial services in the economy. To encourage people to use wallets more often, it also added mom-and-pop stores to the ecosystem. "People want an easy life. Therefore, demystify technology, make it user-friendly and deepen its usage in communities. Today, 90 percent of Zimbabwe is on digital wallets, with EcoCash as the primary solution," he added.

In India, given its large population, the scale is different. According to Sarath, the RBI has done a brilliant job with the JAM (Jan Dhan-Aadhaar-Mobile) initiative, which is a stepping stone to reach every nook and corner of the country. "In India, digital wallets are all about reach, safety and ease of use. The question is whether we can create a system for financial transactions that is as easy as consuming video content. And to do that, you need to think as a platform and not as a product," he said.



Focusing on the overall financial lifecycle of consumers

In March 2021, Unified Payments Interface (UPI) topped the Rs 5 trillion mark in terms of value of transactions, which is double the amount from last year. Srinivas said that while the COVID-19 pandemic may have accelerated it, on a whole, cash transactions have come down significantly. "We need to think how we can make transactions seamless for merchants, customers and businesses alike. For this, super apps have been an easier way to facilitate payments through mobile."

Digital wallets can also explore other areas like loans, insurance, wealth creation and so on. "We have to believe and think like a platform and start open APIs to work with

everyone. We are the ones putting user experience in the hands of people, but we also need partners to try new and different ways to generate loans, insurance and so on. Users will benefit from the competition. After all, you run as fast as the dog that chases you," said Hernando.

The challenge lies in changing consumer habits, but the panelists agreed that the right strategy backed by technology can help change that. Like how WhatsApp and Facebook transformed the way we socialise or communicate, it's possible with payments too.



Overcoming barriers beyond geographies

Hurdles like infrastructure and traditional habits remain barriers to greater digital payments adoption, but the primary focus for entrepreneurs is to face challenges head-on and work on the problem they are solving. "Today, smartphone manufacturers are creating affordable phones. Entrepreneurs need to grab the opportunity, be innovative and make sure that transactions go above and beyond to become global payment systems," said Eddie.

In India, there is no one solution to solve for a large audience. For the bottom of the pyramid, it's about reach but for Millennials, it's about a simple and safe experience. In deep rural areas, 'phygital' systems are the way forward, where local merchants who provide telecom services enable digital payments for villagers. "The treatment they get at the bank is not optimal, but at a kirana store, there is a trust because of their previous engagements. Phygital will be a stepping stone to get first-time digital customers to trust the process," said Sarath.



Possibilities of a cardless future

On whether physical cards will be replaced by virtual cards in the future, the panelists said that while the latter is a convenient option for consumers, it will take time to get there. While cash transactions have reduced in India, when it comes to the digitisation of cards, the adoption curve is slow. On the other hand, in Zimbabwe, when they started the mobile money business, they started with virtual cards, so mom-and-pop shops have reacted well to it.



Security is key for a high-volume business

Agreeing on how strong security measures were crucial for the success of digital-based payment systems, the panellists also talked about their myriad aspects and challenges. In India, the RBI is focused on customer trust and security. "We spend a lot of time ensuring that our products are safe. There are several machine learning algorithms that we use to ensure that we don't become a part of conduit fraud. We even launched Airtel Safeway for this purpose," said Sarath.

"There are three pillars of security - technology, process and people, but the weakest link of the three is people," said Srinivas

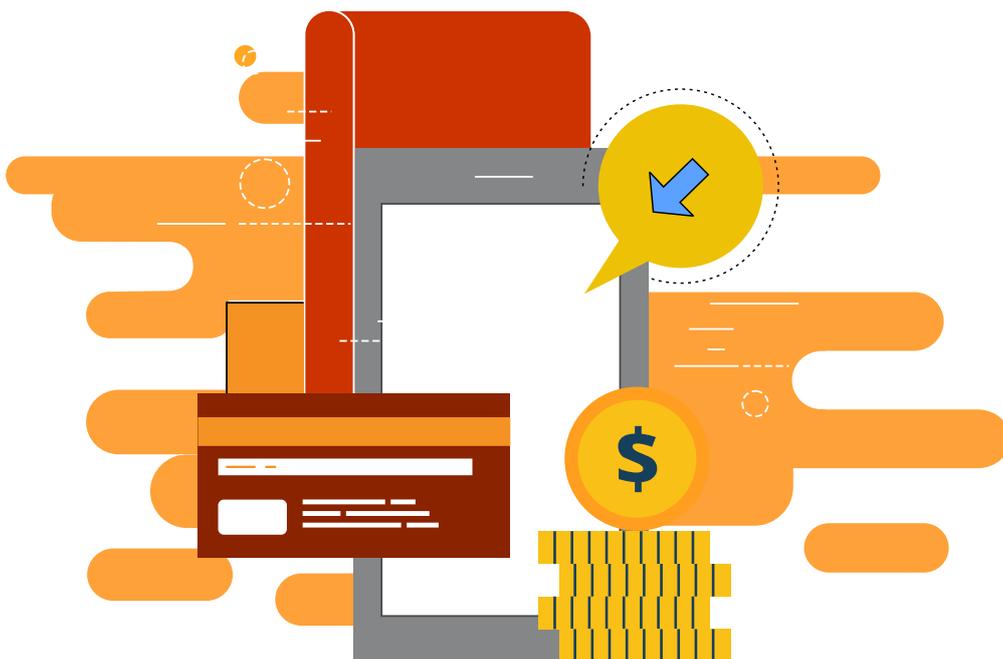
Authentication is also a huge challenge for consumers while opening accounts due to the need of fulfilling KYC compliance norms. "You need it because today's bank robbers

are out to steal from digital wallets. But if you increase risk solutions, you end up decreasing your funnel of conversions. We need the most clever people out there

working on authentication and cybersecurity solutions," said Hernando.

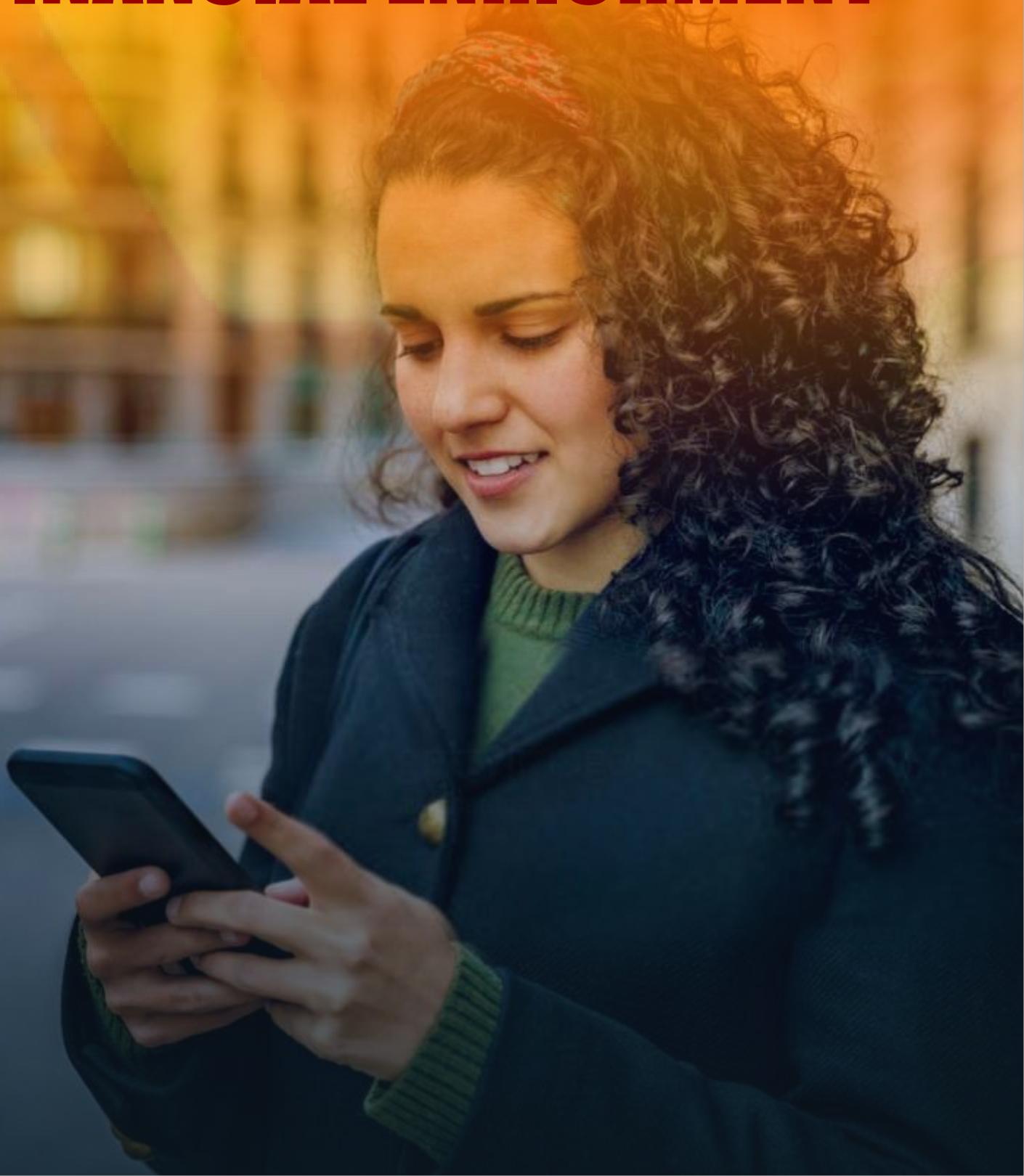
At the end of the day, what's most important is customer awareness.

[Watch the full conversation here](#)





DIGITAL WALLETS: FROM FINANCIAL INCLUSION TO FINANCIAL ENRICHMENT





Mohit Bhargava

Digital wallets have revolutionized the financial services industry by providing instant and convenient payment to consumers. In many countries, digital wallets have democratized payments, by enabling everyone - unbanked or banked to use these services. Consequently, digital wallets have seen mass adoption globally. According to Juniper Research, there were 2.6 billion unique digital wallet users globally in 2020, which will increase to 4.4 billion by 2025.

In emerging economies of Africa, Asia Pacific and Latin America, digital wallets were introduced with the primary objective of increasing financial inclusion. The digital wallets met this objective to a great extent by bringing unbanked people into the formal financial ecosystem through pervasive digital channels like mobile phones and today in many countries digital wallet penetration far exceeds bank penetration. Digital wallets have provided easy-to-use, quick and cost effective money transfers, payments, savings and micro-loans services to the unbanked people, fulfilling their basic financial needs. With the key objective of financial inclusion on track, digital wallets are now evolving from financial inclusion to financial enrichment. Digital wallet providers are now moving beyond basic payment use cases to more sophisticated investment use cases such as stock trading, crypto asset trading, gold trading etc. In this article, we will look at some of the recently launched investment service on popular digital wallets from three continents.

Colombia



MOVII Enabling Crypto Asset Purchase and Sale

Government of Colombia's Ministry of Finance & Public Credit in 2014 introduced 'Financial Inclusion Law', under which it allowed the creation of Companies Specialized in Electronic Payments and Deposits (Sociedades Especializadas en Depósitos y Pagos Electrónicos' abbreviated as SEDPE). The objective of SEDPEs is to increase financial inclusion by enabling unbanked people to open low-balance financial account quickly through digital channels like the mobile phone with minimum documents.

Leveraging Financial Inclusion Law, the first SEDPE launched in Colombia was MOVII in 2018. MOVII is Colombia's first completely digital wallet where everything from customer on-boarding to payments is done digitally using a mobile phone. MOVII allows anyone in Colombia over the age of 12 to download MOVII mobile app and open a digital wallet account to transfer money, get loans, receive financial-aid, pay bills, make merchant payments, recharge mobile-connection and buy digital-content etc. MOVII has over 2 million people using its digital wallet.

In April 2020, at the beginning of the COVID-19 pandemic in Colombia, Government of Colombia partnered with MOVII to disburse solidarity income (financial-aid) to economically vulnerable families. Many of these economically vulnerable families were unbanked. Hence Government of Colombia selected MOVII as it allows economically vulnerable families to quickly open zero-cost, affordable, no-frills financial mobile wallet account digitally using mobile phone, without the need queuing-up at physical bank branches, which could potentially lead to spread of COVID. More than 200,000 economically vulnerable

families are receiving solidarity income of COP160,000 (US\$ 43) every month since April 2020 through MOVII.

MOVII did not want to restrict it to the financially underserved segment only. It wants to offer a diverse service portfolio meeting financial needs of various consumer segments. Crypto transactions have gained immense popularity in Colombia, with the country ranked amongst the leaders in this field. Hence, in July 2021, MOVII launched first of its kind crypto transaction service. MOVII has partnered with Crypto exchange 'Bitpoint' on which consumers can buy or sell Crypto assets. MOVII is also partnering with another Crypto exchange called 'Panda'.

Consumers need to make an account at Bitpoint exchange which can be loaded with money through MOVII wallet. For loading money into Crypto exchange account, consumers have to log in to MOVII app, select Crypto option, select the Crypto Exchange (Bitpoint or Panda), enter the amount and confirm the transaction. With money in their Bitpoint account, consumers can purchase crypto assets.

Consumers can also transfer money from Bitpoint account to MOVII wallet. To do this, consumers have to log in to Bitpoint exchange account, choose the wallet option, go to the USD currency and click on withdraw. Then they have to select MOVII as means of withdrawal, enter registered mobile number and the amount to withdraw and finally confirm the transaction.



Source: MOVII Twitter

Uganda



MTN Mobile Money Facilitating Stock Trading

In Uganda, digital wallets or mobile money services like MTN Mobile Money (MTN MoMo) and Airtel Money were introduced in 2009, with the aim to financially include the unbanked. Now, more than a decade later, 77% of Uganda’s adults have an active mobile money account, compared to 43% of adults with a bank deposit account [Source: Bank of Uganda Financial Inclusion Indicator Jun-19], indicating that the financial inclusion objective has been achieved to a great extent. Thanks to these digital wallets, today, even unbanked consumers in Uganda can do any financial transaction from their mobile phone ranging from making domestic and international money transfer to savings and loans and from paying bills and merchant to receiving salary and financial-aid.

The digital wallets in Uganda are evolving further with the addition of new use case like stock trading. In September 2021, Uganda Security Exchange (USE) partnered with MTN Mobile Money to digitalize Securities Central Depository (SCD) account opening process. Anyone who wishes to invest in the stock market in Uganda must open a SCD

account. SCD account is an electronic account on which securities are held and any transactions regarding trades or transfers on the stock market are effected on this account. MTN Mobile Money customers with a valid Ugandan National Identification card can open a SCD account from their mobile phone through the My MTN App or by dialling *165*65# USSD Code and following the prompts. After successful SCD account opening, customers will receive a SCD account number using which customers will be able to buy stocks, bonds and share and pay for it via MTN Mobile Money service. In October 2021, MTN launched its IPO, which consumers can apply and pay through MTN Mobile Money.

The mobile-based SCD account opening and stock trading process is simpler and convenient compared to existing processes and is accessible through all mobile phones – smartphones as well as feature phones. The service has democratized stock trading in Uganda as even unbanked and everyday Ugandans can easily open a SCD account easily and remotely using mobile phone and subsequently invest in any of the companies and debt instruments listed on the USE. This will boost participation of individuals and small investors in Uganda’s stock market.



Source: MTN Uganda Twitter

India



Google Pay Providing Gold Trading

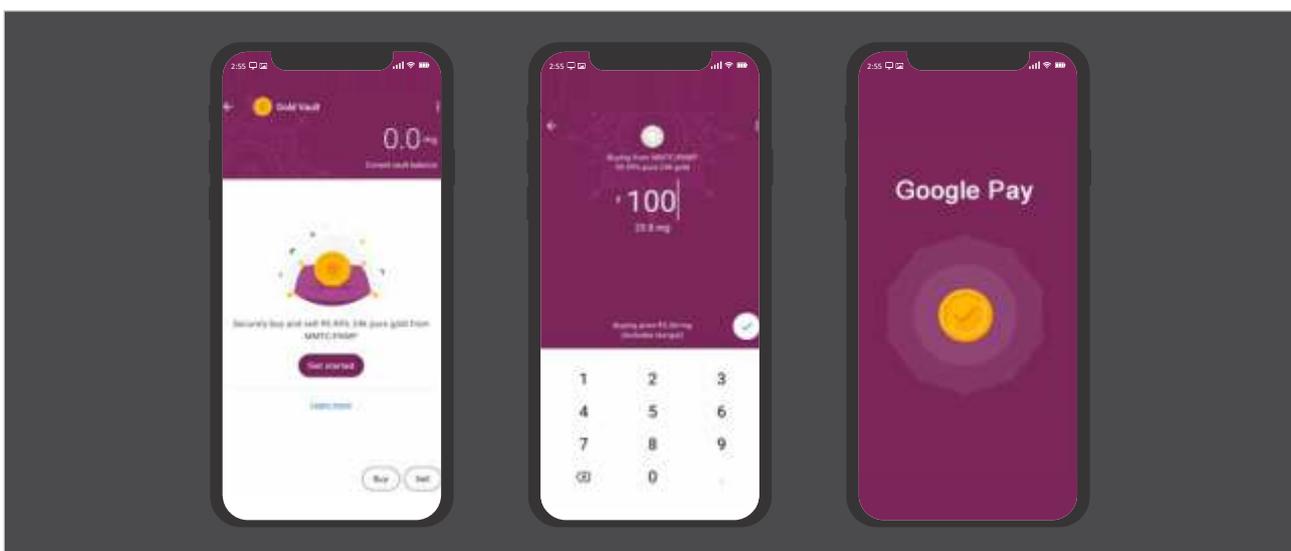
In India, digital wallets like Google Pay, PhonePe and Paytm, running on the rails of Unified Payment Interface (UPI) and QR Codes, have digitized cash transfers and payments. Today, many merchants in the country, ranging from popular retail chains to local grocery stores and road-side kiosks accept payments digitally through these wallets. While the digital wallets have focused mainly on the bill and merchant payments and money transfers use-cases which forms majority of the transactions, they have also introduced investment use cases like gold trading which is closely aligned to the local traditions.

Gold is core to local culture and traditions in India. People consider it auspicious to buy Gold on festivals and gift it during weddings and rituals. People also buy Gold as an investment instrument, which can be used in difficult times or during occasions like weddings which requires big expenditure. Due to these reasons, India is the second

largest consumer of Gold in the world.

Building upon the centrality of gold in Indian culture, Google Pay introduced 'Gold Locker' service for Gold trading. Google Pay partnered with bullion refiner MMTC-PAMP India to allow Google Pay users to buy and sell gold through the digital wallet app. Google Pay users can buy 99.99% 24 karat gold anytime instantly at the Gold price shown in the app. The Gold price is refreshed every few minutes and displayed in the app. The Gold purchased is stored on behalf of the user, by MMTC-PAMP, in secure vaults and can be sold at any time through the app at the latest price. This is usually referred to as 'Digital Gold'. Initially the consumers also had the option of getting the gold delivered to them in physical form, however, the delivery service was stopped during the COVID-19 pandemic. Consumers also have the option to gift the gold to family and friends.

With addition of use-cases like stock, crypto-asset and gold trading, digital wallets are not just democratizing investment services, but also becoming an appealing financial service to all consumer segments. This will further lead to the growth of digital wallets both in terms of customers and transactions.



Source: Moneyexcel.com

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About the Author – Mohit Bhargava has over thirteen years of work experience in product marketing and research in the telecom and digital financial services domains. He works at Comviva, as Deputy General Manager, Product Marketing for the Digital Financial Solutions portfolio. His areas of function primarily include evangelizing Comviva's digital financial products and their impact on transforming the financial landscape globally. Mohit is an avid believer of "technology for good" and has contributed to various online and print publications on the subject. He is one of the co-authors of 'The PAYTECH Book' from Fintech Circle, the first crowdsourced book on payment technologies and new business models in the global payment sector published by Wiley in 2019.

DIGITAL PAYMENTS REVOLUTION IN SUB-SAHARAN AFRICA





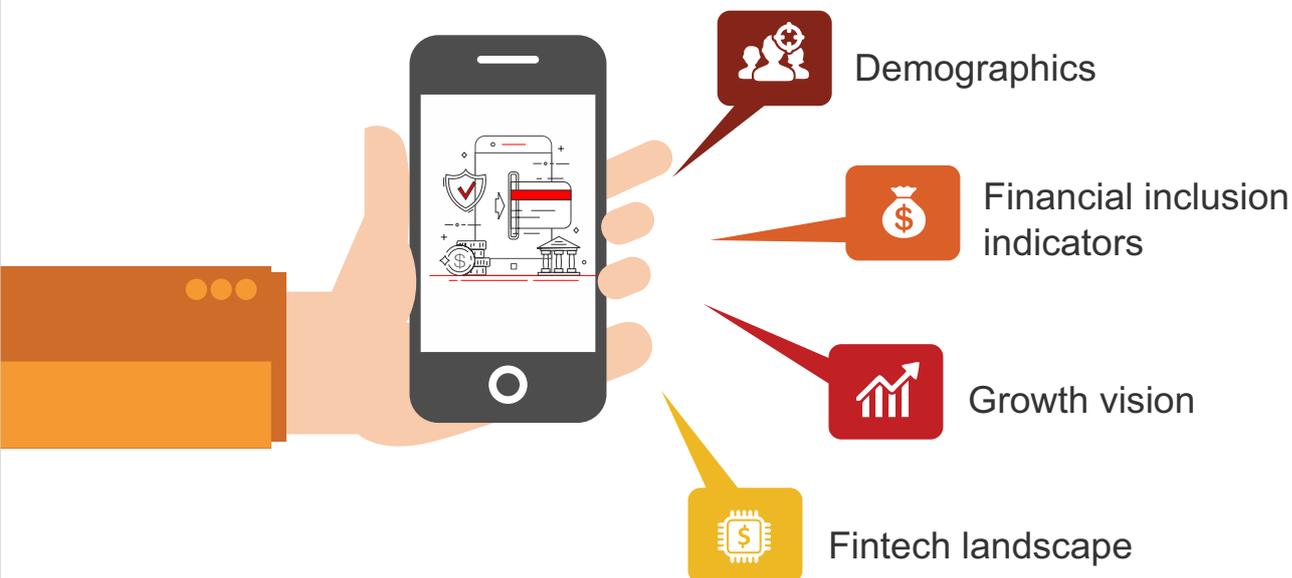
Aakar Shivankar

The Sub-Saharan Africa region has become a very lucrative land of opportunities for providers of digital financial services due to the niche demographic and economic environment. The main driver to the rise of digital financial services in the region has increased by the less developed financial infrastructure and an unbanked population of 60 percent (EY market overview report, 2019). By providing access to this target segment, digital financial service providers have played a pivotal role in improving the financial inclusion of this region. The proportion of unbanked and underbanked population blended with a mobile penetration of 45 percent and internet penetration of 26 percent has laid the foundation for the expansion of Digital Payments. Statistics show that mobile subscribers and internet users will increase with a CAGR of 4.3 percent and 9.7 percent, respectively, between 2019 – 2025. An example of significant growth by digital payments can be observed in Kenya where a large mobile payment provider – Mpesa has revolutionized the idea of making payments to such an extent that 45 percent of the country's GDP has been processed through its digital infrastructure. Looking at the fintech ecosystem, the three main hubs that form the backbone of the fintech sector in Sub-Saharan Africa are South Africa, Kenya, and Nigeria. South African FinTechs are predominantly present in both Cape Town and Johannesburg. Its focus is strategically placed on enabling FinTech segments, making the country one of the main contributors to the growth of FinTech across the continent. Kenya, the second largest FinTech hub, has a stronger focus on the payments segment. The Kenyan hub is present in Nairobi, which is home to more than 50 FinTechs. Nigeria's FinTech sector is the third-largest hub, with most of its FinTechs based in Lagos.

Digital payment adoption has drastically increased in this pandemic as consumers preferred to stay at home due to various restrictions and merchants finding new ways of operating. E-commerce transactions in the region increased exponentially, with merchants and consumers showing a sustained preference for digital payments. The total value of e-commerce in Africa reached \$16.5 billion in 2017 and is expecting to reach \$29 billion by 2022. Nigeria, South Africa, and Kenya account for more than half of the

online shoppers in Africa. Nigeria is Africa's largest business-to-consumer e-commerce market in terms of both the number of shoppers and revenue.

This article presents a glimpse of the market potential of different countries across Sub-Saharan Africa. The seven countries targeted are Zimbabwe, Kenya, Nigeria, South Africa, Ghana, Zambia, and Tanzania. These countries are chosen as best markets for digital payments by evaluating parameters like



Zimbabwe



Around **4 Million** Zimbabweans live abroad, and the remittances sector constitutes **7.8 percent** of GDP. South Africa has the largest no. of Zimbabweans.



Zimswitch is the national switch with **19** commercial banks integrated with it. Also, the product line includes **700+ POS** terminals and **400+ automated** teller machines.



ICT infrastructure has increased rapidly, with social media penetration growth of **32.7 percent**. It can be an opportunity for digital payment players to more convenient, safer, and cost-effective payments via social media. Also, social media platforms can help digital payments service providers to initiate promotional campaigns and rewards to attract more customers.



8.5 million population in Zimbabwe has an account with a financial institution



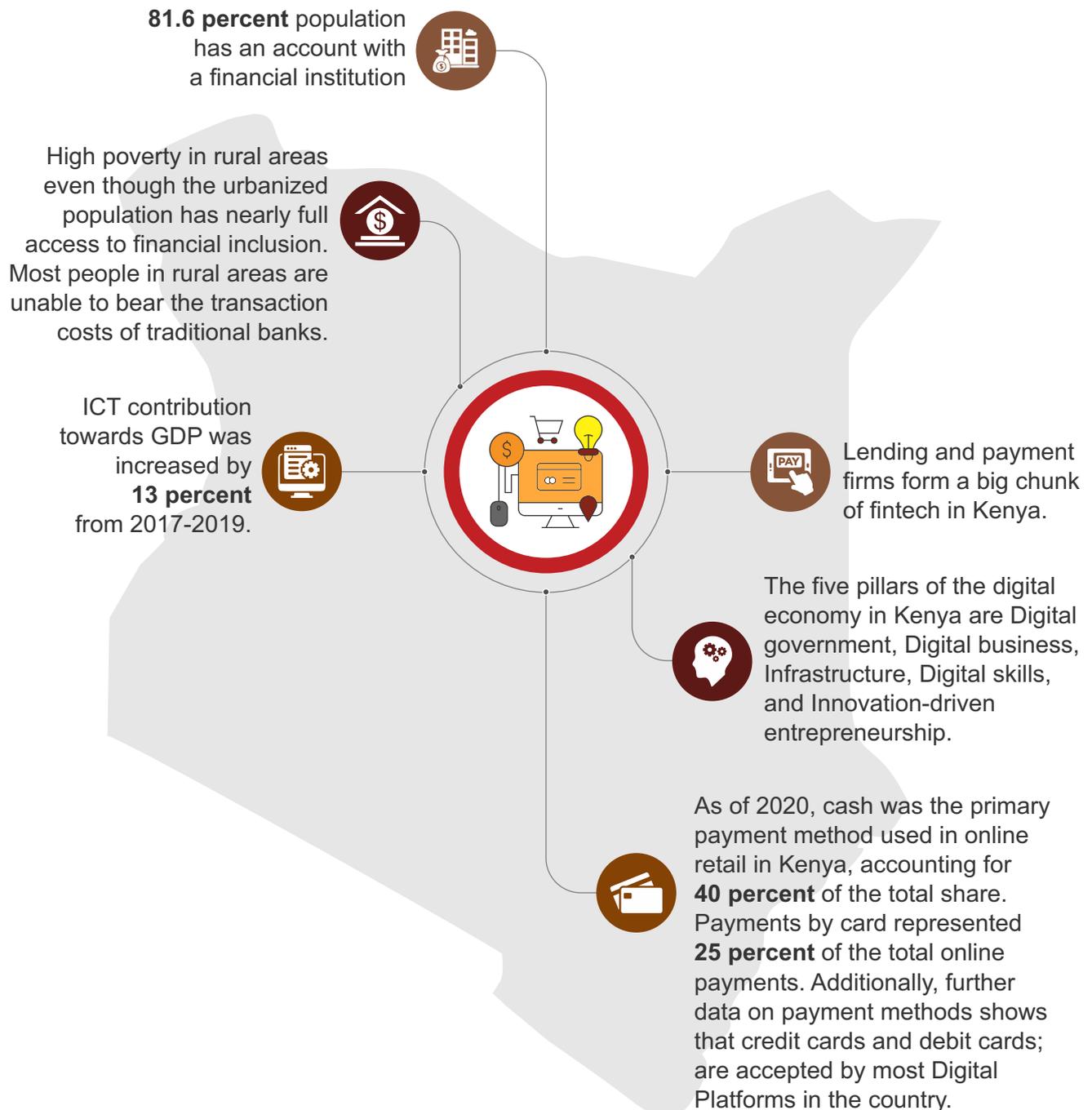
Active registered mobile money subscriptions increased by over **140 percent**, from **3.19 million** in March 2016 to **7.67 million** in March 2020.



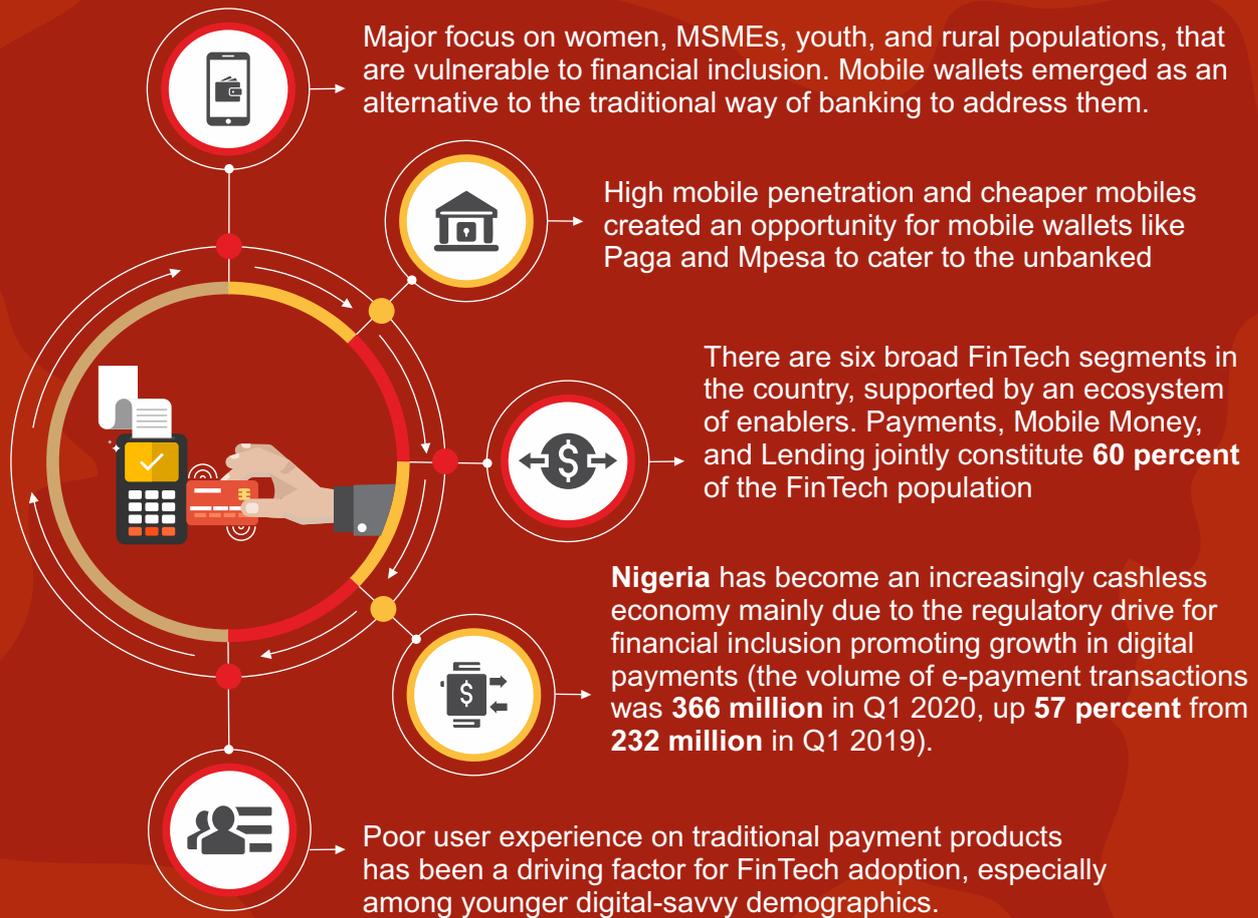
The digital payment space is dominated by Ecocash with a **90 percent** market share, with players like Telecash and MyCash trying to challenge the giant.



Kenya



Nigeria



South Africa

The Country consists of a dual economy – a formal sector consisting of an urban population and has reasonable access to a formal financial institution and an informal and underdeveloped sector called rural economy

There are a higher number of Fintechs in SA than in any other country. SA fintech industry is focused on: payments, deposits and lending, capital raising, investment management, and market provisioning.

Even if the economy has **70 percent** bank accounts, **50 percent** of its users still use cash



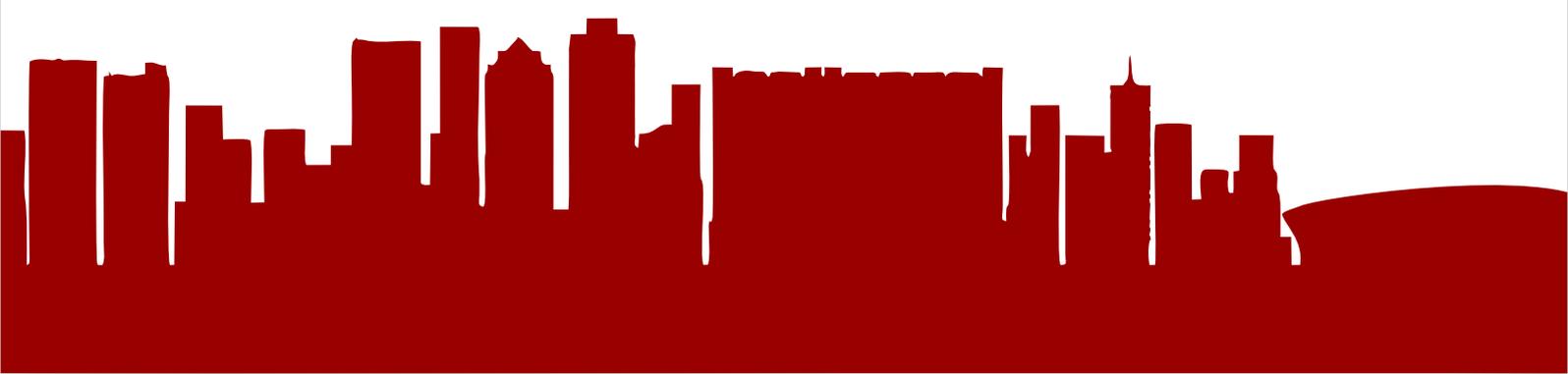
The total no. of digital commerce users is predicted to reach **33.4 million** by 2025. E-commerce penetration as of 2020 is **37 percent**



The SMEs sector is still underdeveloped in the region



South Africa has a well-developed National Payment System (NPS) with banks, non-banks, clearinghouses, system operators, and third-party payment providers, all contributing to the sector



Ghana

Ghana has been acknowledged by the world bank as the fastest growing mobile money market

Digital commerce ramping up due to government initiatives like **Ghana online mall**, digital marketing, and made in **Ghana mall**

The government aims to push financial inclusion from 58 percent now to **85 percent** in 2023

Government seeks to cut down operational costs that they incur from traditional methods of banking and payments and increase their revenue by the inclusion of more customers for G2P and P2G payments

57.7 percent population has an account with a financial institution

The number of active registered mobile money accounts and agents increased by **10.7** and **25.3 percent** from 2018 to the end of 2019

The main focus areas are G2P payments and last-mile agent banking



Tanzania

In the Digital Commerce segment, the number of users is expected to amount to **14.2 million** users by 2025

There is a low level of digital penetration in **Tanzania**, with an internet penetration of **25 percent**.

Digital **Tanzania** program, ICT policies are established to improve digital penetration.

In Tanzania, the fintech sector is still nascent, with less than **50** companies, among which **68 percent** are in their early stages, and **20 percent** are still at the pre-startup stage and not fully launched.



Adults with an account in the financial institution and mobile money constitute **46.8 percent** and **38.5 percent**, respectively



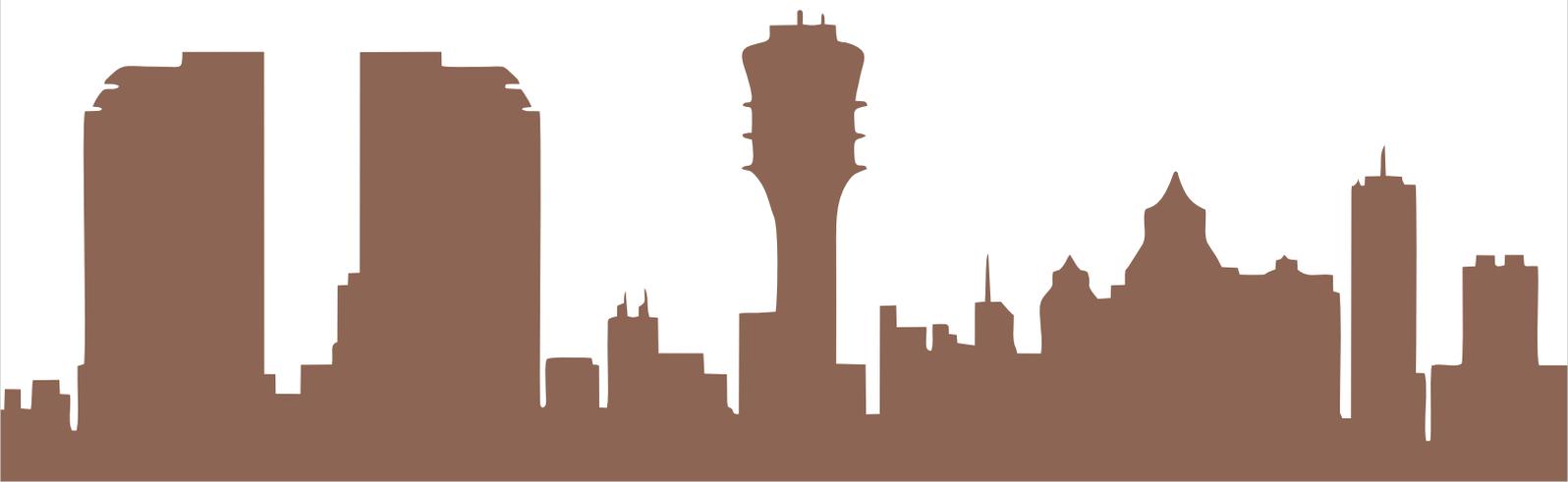
The mobile money sector in **Tanzania**, dominated by two providers, namely Safaricom's M-Pesa and Tigo Pesa



Traditional banking causes high transactional costs that become expensive for the rural population



Despite the rapid growth of digital financial services, financial inclusion is high – rural areas, youth, women, and smallholder farmers



Zambia

Mobile money account penetration stands at **27.8 percent**. Incentives for agents and giving them the tools to manage their balances and grow their enterprises together has led to a remarkable increase in the touchpoints for mobile money

Currently, **Zambia** is among the **top 10** least developed countries for e-government.

E-commerce is limited in **Zambia**
– Weak physical addressing, expensive logistics, limited access to the internet and smartphones



Active digital finance accounts now represent **44 percent** of the adult population compared to **2%** in 2014

SMART **Zambia** sets a target of having **180** government services online

There are at least **25** fintech developing solutions across sectors, ranging from Financial Services, Pay-Go Solar, Health, Education, Agriculture, and many more.

As of **2018**, **91 percent** of **Zambian** consumers are allowed to pay with credit cards. **18%** of the platforms could receive customer payments from bank accounts



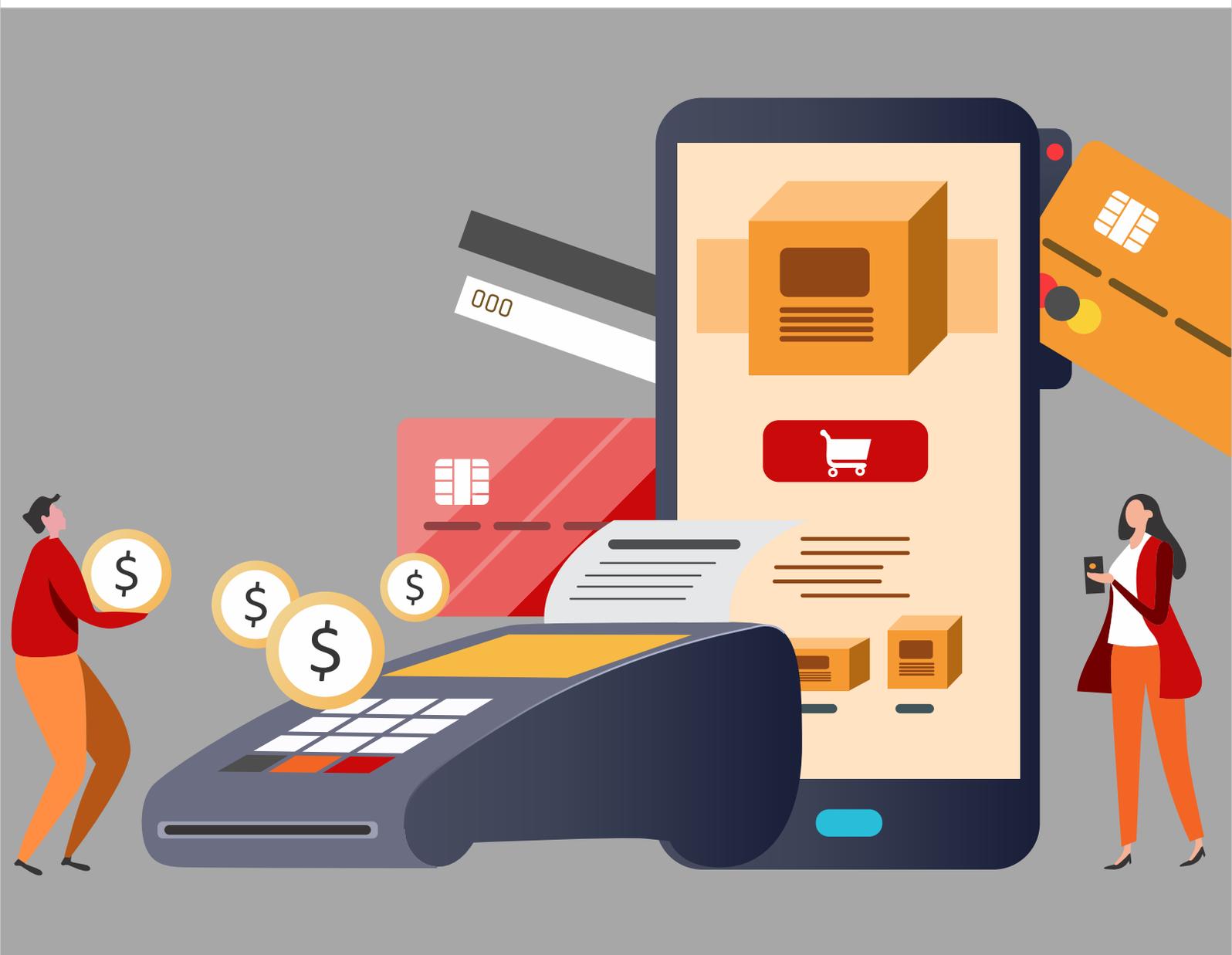
Conclusion

With its young, growing, and tech-savvy population, Sub-Saharan Africa is well-positioned for businesses looking to add value. In the longer term, as FinTech firms innovate and become more established across the continent, the 'teething troubles' around payment processing will continue to be addressed.

For example, the key players in Africa's payment ecosystem are finding more ways to unite multiple banking processes, technologies, and systems. A good example is the Nigeria Interbank Settlement System (NIBSS), helping banks come together, to remove

bottlenecks associated with interbank funds transfer and settlement. There's also Flutterwave, whose payment gateway system allows businesses to accept various payment methods including, Local Bank Payments and International Bank.

Looking at the ongoing development in technology and innovative payment solutions making their way in the Sub-Saharan market, it is just a matter of few years for the region to become a powerhouse in the Digital Financial Services sector.



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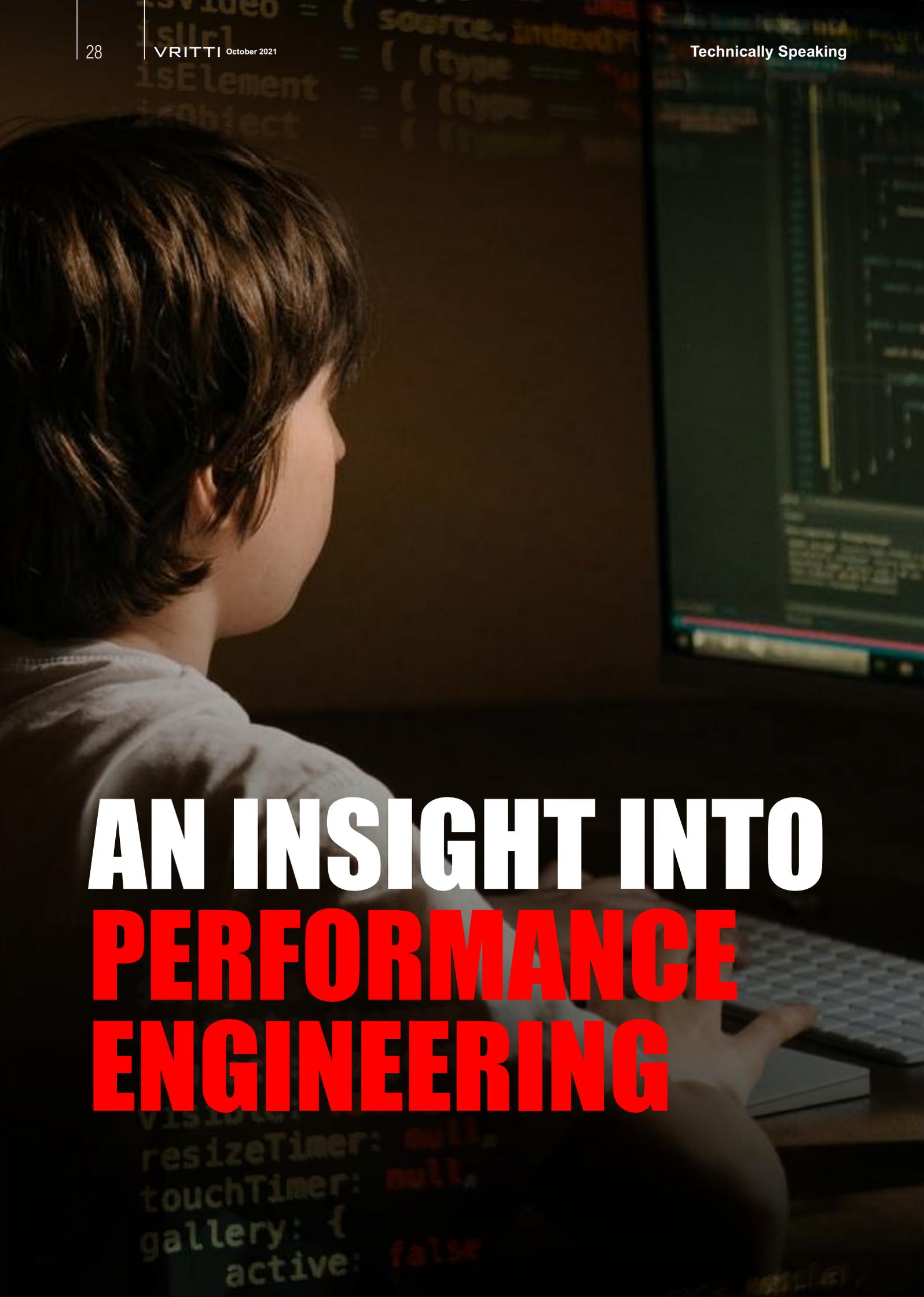
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About the Author – **Aakar Shivankar** has two years of work experience in diverse domains, starting from New Product development to Business Consultant. His responsibilities included creating strategies for Business expansion with the help of Market research, Analysis and strategic frameworks. At Comviva, he is working as a Global Business Consultant for the digital financial services portfolio. His role primarily demands identification of the underlying needs of organizations globally and help them to evolve their business continuously.



AN INSIGHT INTO PERFORMANCE ENGINEERING

**VISHNU KUMAR**

How a code working in developer and test environment failed in production environment ? This is a very familiar question and we all know the answer and answer is to add performance engineering stage in software development life cycle. Still most of product organisations are confused what to do to and how to do.

Performance engineering is not only a load testing but it is to understand user behaviour & pattern , how they interact with your platform and simulating that in controlled lab environment.

Before we talk about engineering side of it, let's understand what type of skill set is needed for to have performance engineering practices in your organisation.

Team

Performance engineering is one area of site reliability engineering. It need engineers who have programming skills, understand each layer of production system, deployment architecture and have attitude to solve operational problems with software engineering.

Why programming is essential skill for a performance engineer? He needs to code user behaviour exactly the way user interact with system. He needs to automate test execution, report extraction, matrices comparison and other repetitive tasks so that he focus more on problem detection and fixing.

Tools

To execute performance test, many tools are available. I recommend tools which are light-weight, can spawn million of users on low configuration machine and have programming capability.

Locust and Gatlin support performance as a code. Can be integrated with CICD pipeline for continuous performance testing.

KPI

Performance engineering is centric on two main KPIs

1. Response Time

This is a very critical matric which must be consistent even at high throughput.

Consider below as important criteria for simulation.

- Understand possible user behaviour for services consist of 90% of traffic.
- Measure 90 percentile average response time instead average response time.
- Let hardware resources exhausted till 60% utilisation.

As an industry practice, All APIs should respond within 200ms range.

2. Cost

Performance engineering is a continuous improvement in hardware needs for same throughput.

Performance Engineering of mobiquity® PayX:

mobiquity® Pay X is a next generation, cloud ready version of award winning stored value wallet management platform. We at Comviva have incorporated continuous performance engineering practices integrated as part of product release pipeline.

Our performance engineering team is a highly skilled set of developers who have production experience and work toward optimising response time and cost of product.

Continuous Performance

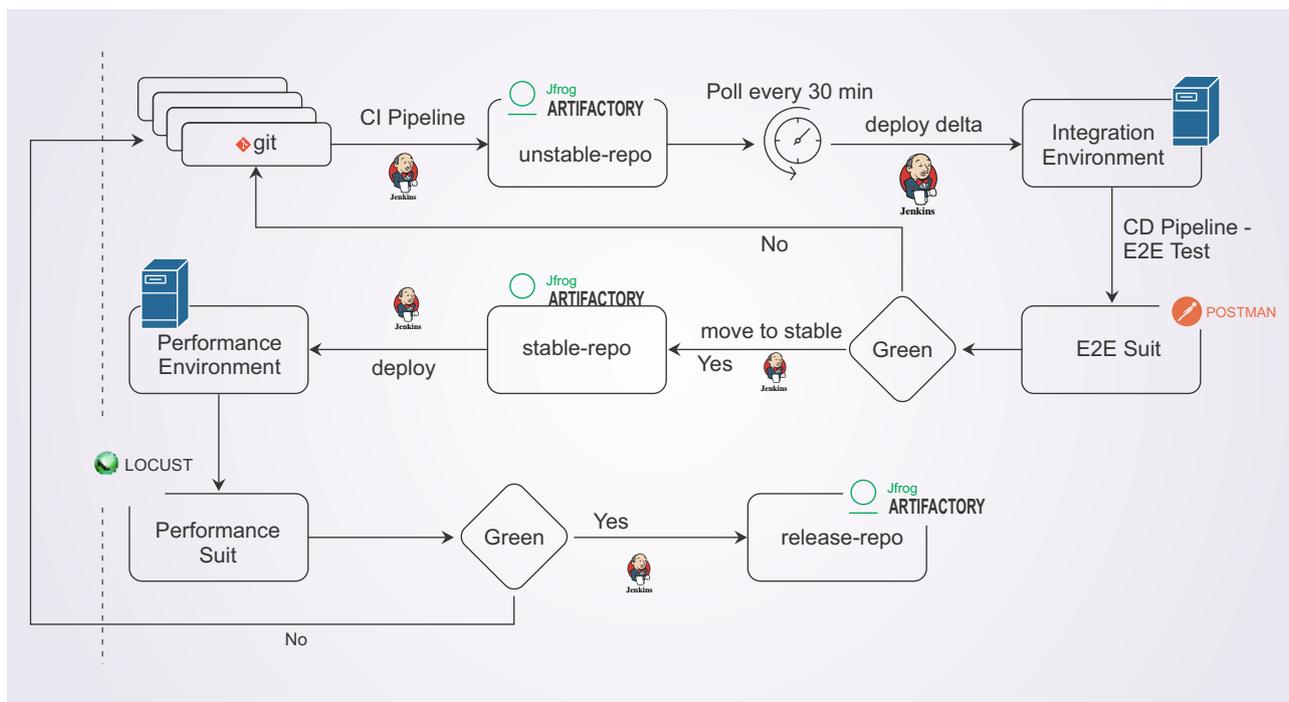
The first challenge was to identify the user behaviour. We having large customer base, got lot of data input to identify traffic pattern, daily active user base and most used services.

After that scripting was easy. We used python to script user tasks and Locust as performance load tool.

Idea was to automate all repetitive tasks so that team can focus on tuning response time and cost , main KPI for this exercise. Below tasks are automated and integrated part of CICD pipeline.

- Define traffic conditions
- Execute Load
- Compare results with expected results
- Prepare report
- Re-run.

Pipeline



End to End pipeline as presented in diagram, build is promoted to performance environment after functional tests are passed successfully.

All performance results including application matrices, JVM matrices, infra matrices , failure rates etc are scrapped by exporters

into Prometheus and visualised by Grafana.

We also integrated slack to notify results and analysis as a part of pipeline itself.

Performance engineering if planned properly and is part of development life cycle, can help avoid lot of surprises in production systems.

About the Author – Vishnu Kumar is Senior Solution Architect at Comviva. Vishnu has worked in IT industry for 15 years and has proven record in software development, enterprise integration, implementation and technical leadership. He is a technologist having deep interest in software architecture patterns and is proficient in identifying key bottlenecks in system architecture / engineering processes and bringing efficiency and cost reduction in technology. He has hands-on experience in refactoring and re-design of monolithic applications into micro service and modular architecture.

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