Digital Inclusion

A pay-as-you-go FTTH solution for low income markets

White paper

Informal economies across emerging markets represent vibrant and entrepreneurial forces.. Home to millions of small-scale traders, workers, and families who live without formal contracts, regular income, or consistent infrastructure. These communities, though economically constrained, are digitally curious and active, relying heavily on mobile phones to stay connected, informed, and engaged. But mobile data is expensive, unpredictable, and often inadequate for the demands of today's digital world.

This whitepaper introduces an emerging model for fixed broadband access designed specifically for these underserved markets: a pay-as-you-go (PAYG) fiber solution that mirrors how people in informal economies already buy what they need - on demand, in small, affordable increments.

Backed by field learnings and Nokia's extensive broadband technology leadership, this model proposes:

- Fiber based connectivity, based on widely deployed PON technology
- Time-based service packages (hourly, daily, weekly) with no contracts, no data caps, and no complexity.
- Community-wide Wi-Fi coverage powered by high-quality Optical Network Terminals (ONTs) and a fiber backbone.
- Local reseller networks and employment opportunities to distribute access and build trust.
- Cloud-native platforms to optimize deployments, enhance Wi-Fi performance, automate user activation and network management (Broadband Easy, Altiplano and Corteca).
- The opportunity is enormous. By enabling internet access in a way that matches people's daily cash flows and mobility patterns, this model can unlock the spending power of a massive, untapped segment of the global market. In doing so, it also drives digital inclusion, builds digital skills, and supports long-term social and economic development.

The market dynamics and user behaviors that underpin this opportunity are observed across numerous markets suggests a significant global potential for the successful application and scaling of this model.

The paper outlines the business case, technical design, community engagement strategy, and deployment model. The paper addresses how service providers and partners can pilot this approach with Nokia's support. We close with a call to action: run a small pilot, validate the model, and bring millions more online in a profitable and sustainable manner.

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1 Introduction

A new frontier for fixed broadband.

For decades, the digital economy has grown by focusing on the formal market - homes with addresses, bank accounts, and predictable income. But this model only scratches the surface of what's possible, especially in places like Sub-Saharan Africa, Asia, Latin America and other emerging markets, where the majority of people live, work, and transact in the informal economy.

The informal economy isn't niche. It's not an edge case. It's where most of life happens. In South Africa alone, it represents over 5 million households - families running side hustles, managing spaza shops, working in townships, or simply making do without formal employment or access to credit.

These are people who want connectivity, who need the internet to learn, work, play, transact but who have been systematically priced out or left out by current broadband models. Until now.

This whitepaper presents a bold new approach to fixed broadband, one designed specifically for high-density, low-income communities. It's a model where:

- Fiber is deployed quickly and affordably using aerial builds and local labor.
- Wi-Fi is optimized using intelligent home gateways and cloud control.
- Pricing is pay-as-you-go, in bite-sized units that fit how people live and earn.
- Communities are not just customers, but collaborators. They are building, selling and supporting the network themselves.

In short: it's fiber, reimagined and affordable for all. Not as a luxury for the few, but as essential infrastructure for the many.

Figure 1 Kya Sands, Johannesburg, South Africa



This is more than a technology or business model innovation. It's a social shift that brings millions of people online, drives economic inclusion, and opens an entire new addressable market for broadband providers, content platforms, and financial services.

At Nokia, we've spent years working with partners across the developing markets to understand this opportunity from the ground up. We've looked at the economics of aerial fiber deployment to the behavioral patterns of prepaid Wi-Fi usage, from the risks of vandalism to the power of community-driven network builds.

What we've learned is clear: fiber broadband in low-ARPU markets works. It is an opportunity for operators to extend footprint to vast unserved markets with a successful business case.

This whitepaper distills those learnings into a blueprint. Not just for connecting underserved areas, but for transforming the very way we think about broadband, business models, and inclusion.

The chapters ahead will take you through the full journey:

- Why the informal economy is the greatest untapped business opportunity.
- How a new technical and commercial model makes fiber viable in high-density, low-income areas.
- What it takes to build, operate, and grow networks in collaboration with the communities they serve.
- And how to test this model today with a pilot that's small, fast, and measurable.

The market is ready. The solution is proven. The economics are sound.

2 The challenge of serving the informal economy with fixed broadband

Communities facing economic barriers have proven remarkably agile. Despite limited access to formal infrastructure or government support, these communities have built a vibrant, self-sustaining ecosystem - a parallel informal economy that mirrors the formal one in structure but operates with its own logic.

Every vertical in the formal economy, e.g., retail, food, healthcare, education and transport, has its counterpart or mirror in the informal economy. However, the informal equivalents function differently. They are hyper-adaptive, transaction-based, and optimized for cash flow rather than margin or growth. Their models prioritize accessibility, immediacy, and flexibility.

2.1 Informal vs. formal: a tale of two economies

A simple comparison in the retail sector illustrates this contrast.

A middle-income family living within the formal economy might buy a pack of 6 or 8 bath soap bars, one for each family member, bought in bulk for convenience and savings. In the informal economy, a low-income family is more likely to buy a single bar of soap and share it or even buy a sliver of a bar sold in micro-quantities at a local street vendor.

The difference is not just affordability; it's about cash flow, daily survival, and trust in the system.

Another example comes from North Africa, particularly in Morocco, where informal street vendors offer mobile phone recharges in tiny amounts. 1 or 2 dirhams at a time - allowing users to stay connected without committing to monthly bundles. These micro top-up models have become a lifeline for millions, replacing traditional postpaid plans with ultra-granular, cash-driven access.

What these examples show is a pattern: buying in singles, pay-as-you-use, and on-the-go access, dominates. Yet for some reason, this logic has not yet been translated to broadband, especially fixed broadband.

2.2 The missing telecoms mirror in the informal economy

Despite broadband becoming a basic human need, the telecommunications sector has failed to reflect itself in the informal economy. Unlike retail, food, or mobile money, there is no scalable broadband model that meets the needs of these underserved communities.

Let's review what's currently available in economically constrained communities:

- **Mobile broadband**. While widely available, mobile internet is expensive for high data use, priced on a usage model (per MB or GB), and designed for individual devices, not households. In dense informal settlements, mobile signals can degrade due to congestion and interference. A family of five cannot reasonably share a single data SIM card.
- **Traditional fiber broadband (postpaid or prepaid)**. These models are built for middle-income formal households. Speed-based tiers, long-term subscriptions, and upfront installation fees do not match the cash flow realities of informal communities. Most consumers in these communities do not plan their digital consumption in monthly cycles.
- **Wi-Fi hotspots**. While popular in theory, hotspot models suffer from poor indoor penetration, limited coverage, and a clumsy user journey. Onboarding typically requires complex login, payments, and re-authentication - a frustrating process for users who just want seamless connectivity.

- **Unlicensed Fixed Wireless Access (FWA)**. Technologies like Wi-Fi mesh or point-to-multipoint radio systems have been trialed in informal areas. However, they often face interference, scaling limitations, and service quality issues. Worse, the business model often mimics fiber billing (monthly caps or speed tiers), ignoring the real needs of the market.

None of these solutions reflect the daily, cash-based, and communal behavior of the informal economy. People don't plan data usage in gigabytes. They don't understand, trust, or relate to usage-based billing. They know what they need: always-on, unlimited access - like electricity, water, or transport.

2.3 What the customer actually needs

At first glance, offering always-on, unlimited internet at an affordable price may sound unrealistic. But when you unpack the needs and context, it's not only logical, it's essential.

1. Always-on access

The digital world doesn't stop. Children need access to learning tools at any time. Parents need WhatsApp for work opportunities, updates from relatives, or community news. Always-on internet has become a foundational utility, just like lighting or water.

2. Unlimited usage

Streaming, chatting, voice notes, TikTok videos, YouTube classes - all these consume data in a way that is invisible and unpredictable to the average user. Asking a user to ration gigabytes is like asking them to count how many breaths they take per day. It's an unnatural experience, and one that's quickly rejected.

3. Trust and simplicity

Communities in the informal economy often distrust systems that promise one thing but deliver another. For instance, data bundles that expire, or have hidden usage fees. They prefer simple, transparent offers that align with how they live and spend.

4. Micro-transactions and flexibility

Just like buying one teabag, one cigarette, or one spoonful of cooking oil, these users want to pay for internet in small, flexible units without the fear of running out. This isn't about price per gigabyte. It's about affordable, predictable access.

The informal economy is full of innovation, resilience, and economic logic. It has created its own rules and models, which reflect the way people truly live.

What's needed is not a re-packaging of formal broadband models, but a reinvention: services designed with the same agility, simplicity, and affordability that define the informal economy itself.

3 Unlocking the informal economy with fixed broadband

The informal economy represents more than just a challenge; it represents one of the largest untapped opportunities in the broadband sector. Bringing fixed internet to these communities doesn't just deliver connectivity; it amplifies human potential, creates new revenue streams for service providers and unlocks broader economic and social growth.

3.1 A catalyst for economic growth and social impact

One of the biggest myths is that informal households don't use the internet. In fact, smartphone penetration in informal settlements is rising fast. WhatsApp, Facebook, YouTube, and TikTok are household names, and children are growing up digital.

But these devices are mostly running on expensive, metered mobile data. Users have adapted by rationing access, using data-saving modes, or buying micro-bundles daily. The demand is there. The usage is there. What's missing is a sustainable model that gives them full access at a fair price and unlocks far more value for both the user and the service provider.

Numerous studies, including from RTI International[1] and The World Bank[2], have consistently shown that increased internet access correlates strongly with GDP growth, job creation, educational attainment, and entrepreneurship. In informal communities, connectivity multiplies the impact:

- A student can access digital learning content and improve future employability.
- A micro-entrepreneur can find customers beyond their neighborhood.
- A vendor can use WhatsApp to manage orders and mobile money to close sales.
- A job seeker can tap into work platforms they never had access to before.

The result is incremental income, community resilience, and a long-term growth multiplier for the local economy, all stemming from affordable, reliable internet.

This isn't charity. This is economically productive inclusion - the kind that expands your addressable market as a service provider while simultaneously uplifting underserved communities.

3.2 Revenue starts with the right fundamentals

To succeed in the informal segment, one must recognize the iron law of the market:

size and quality matter. A great product in a bad market will still fail.

So, what defines a strong broadband opportunity in the informal economy?

Population size

Revenue is ultimately device driven. In informal settlements with a high population density, even a modest ARPU (Average Revenue Per User) model becomes viable. More people = more smartphones and connected devices = more potential revenue per square kilometer.

This is particularly important in urban and peri-urban informal settlements, where thousands of households may live in just a few city blocks—the perfect footprint for high-yield, high-density broadband infrastructure.

1 Economic impacts of submarine fiber optic cables and broadband connectivity in South Africa, RTI International here
2 From Connectivity to Services: Digital Transformation in Africa here

Income per household

Look beyond formal income metrics. Households in the informal sector often operate on non-traditional cash flows, drawing income from multiple family members and small-scale activities.

What matters isn't high income, but disposable income and how it's spent. In many informal economies, entertainment, communication, and education compete directly with physical needs. A family that earns $200 a month may still choose to spend $10 on data if the service is valuable, consistent, and easy to access.

Available alternatives

If mobile data is expensive, limited, or unreliable and traditional fiber is non-existent, the informal segment becomes a greenfield opportunity. Go where the competition isn't, or where the existing options are failing users. Fill the gap with a fit-for-purpose broadband model built around simplicity, trust, and local context.

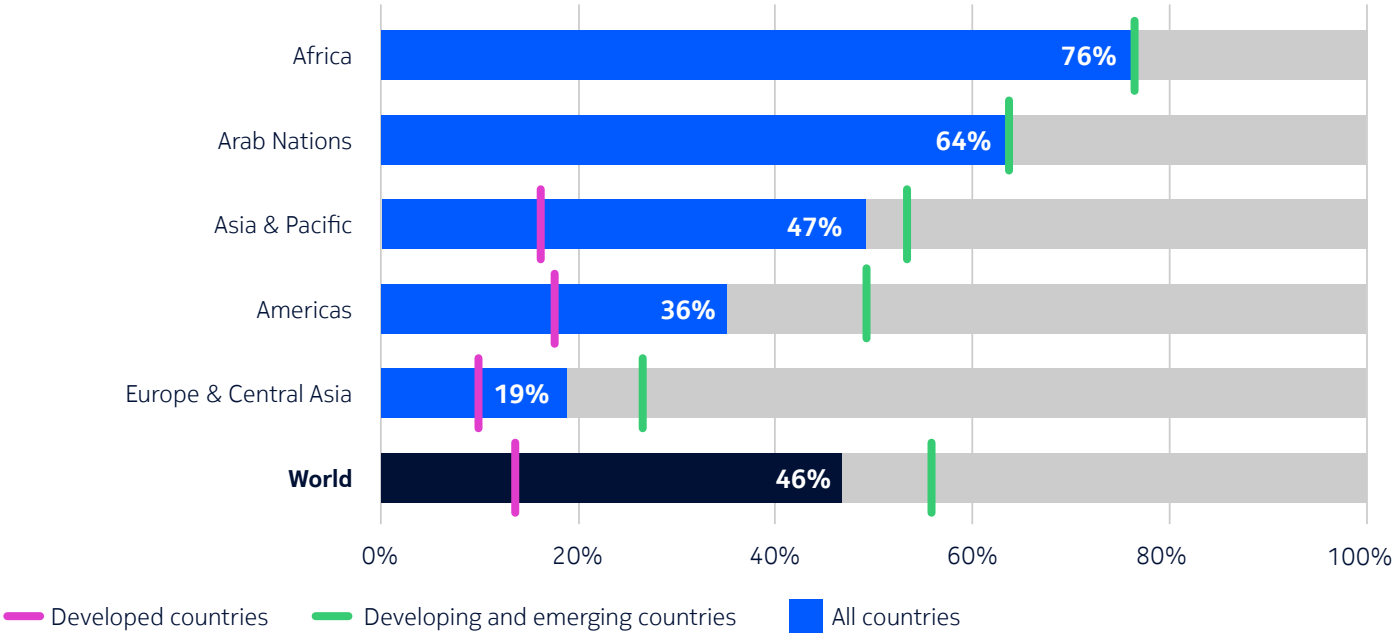
3.3 Sustainable revenue from a massive market

Let's be absolutely clear: the informal economy is not a side-bet. In many emerging economies, it constitutes the majority of the market.

According to the International Labor Organization (ILO):

- In the Global South, most workers are employed informally.
- And Africa has the highest rate of informal employment across all regions worldwide.

Figure 2 (ILO) Informal employment, size and composition (Source: ILO, 2018.)



Notes: South Asia has a higher rate of informal employment than Africa: 78 percent. Because South Asia is grouped with more developed countries in Asia and the Pacific Islands in the chart, this fact is not visible.

But here's what's even more striking but not always captured in national-level statistics: informal employment is even more dominant in cities. In urban centers like Kampala, Dakar, or Lagos, it's common to find that over 80% of the workforce operates in the informal sector. In these settings, informal employment isn't the exception, it's the norm. That changes everything.

This isn't just an economic footnote; it reshapes the broadband market opportunity. Why? Because official income data often underestimates true spending power in informal communities. In reality, families in these areas may have more disposable income than formal metrics suggest, thanks to diverse income streams, communal resource-sharing, and localized spending habits.

This has profound implications for fixed broadband affordability and for how service providers define their addressable market. Across emerging and developing economies informal work and living conditions are part of the urban reality for many families, and many of them are already spending daily on mobile data or airtime, then they can and will pay for better connectivity if it's offered in the right way.

The scale is massive. So is the opportunity.

Service providers who understand and serve this market stand to unlock:

- New revenue streams from households previously labeled as "unserviceable".
- Customer loyalty built on trust, accessibility, and local relevance.
- First-mover advantage in creating a digital foundation for informal cities.
- Positive social impact aligned with national development goals and ESG commitments.

In short, this isn't a fringe market. It's the future. And the service providers who get it right now will be the ones who lead tomorrow.

3.4 Manage your costs to make the model work

This is a volumes game. To make low-ARPU markets work, service providers need cost discipline.

Avoid capital overruns

Large infrastructure projects often fail due to uncontrolled capital expenditure. The dream of affordable internet dies when budgets balloon. In informal communities, where affordability is everything, this is especially risky.

Use collaborative models with local governments, DFIs, or community cooperatives to share costs and risks. Alternatively, pursue fixed-cost deployment contracts to avoid surprises and keep unit economics healthy.

Invest where it matters

Instead of over-engineering, focus spending on:

- Last-mile reach in high-density pockets.
- Cloud-based management and automation to lower OPEX.
- User experience design to make sign-up, payment, and service access seamless.
- Pay-as-you-go, always-on access models that feel natural to informal users.

The informal economy isn't the end of the road; it's the beginning of a new one.

Fixed broadband, when adapted to the logic of this market, becomes both a tool for empowerment and a profitable business opportunity.

But this opportunity demands more than reusing old models. It requires new thinking, cost discipline, and market empathy. Service providers that get this right won't just serve the next billion, they'll grow with them.

4 The solution - a new model for broadband in the informal economy

Imagine communities living with economic constraints. Everyone has seen the documentaries, heard the stories, maybe even visited such neighborhoods. There's something striking about them: a powerful sense of community.

People share what they have. They gather in homes, outside on the streets, in local shops, and places of worship. Most of these communities operate with minimal dependency on formal government or municipal services. And yet, they thrive in their own way.

Now imagine how the internet fits into this world.

Most people here already access the internet using mobile phones. It's portable, familiar, and feels flexible. But we know mobile connectivity falls short in these environments. It's too expensive, too limited in speed and coverage, and based on complex, usage-based pricing that doesn't work for unpredictable incomes.

So, what's the alternative?

We propose a community-wide, time-based fixed broadband model that lets users access the internet on demand, wherever they are in the community. No contracts. No data caps. No confusing speed tiers. Just simple, predictable pricing and frictionless access. Use it when you want. Pay only for the time you need.

This mirrors how goods are already consumed in these economies:

- In South Africa, families buy a single bar of soap to share rather than a bulk pack.
- In Kenya, it's common to buy a single tea bag and spoon of sugar for a quick cup of tea on the way to work.
- In West Africa, you'll find vendors selling small sachets of cooking oil or individual painkillers, because daily income matches daily spending.

Let's now break this approach down further.

4.1 Commercial model

Instead of trying to extract large sums from a few high-value customers, this model takes small amounts of money from a large population on a daily basis. That's the essence of high-volume, low-margin success.

The key pillars of this model are:

- Offer the right product. Easy to understand, simple to use, and priced for everyday access.
- Sell it everywhere. Ensure availability across the community - through shops, kiosks, mobile agents, and digital interfaces.
- Encourage daily use. Create incentives to make access a habit - daily browsing, streaming, chatting, transacting.

The model works because it embraces the informal economy's rhythm: cash-based, high-frequency, low-value transactions. It meets users where they are—literally and financially—turning broadband into a daily utility instead of a luxury.

This is broadband sold the way a sweet vendor or a taxi ride is sold. Fast. Familiar. Flexible. Always available. Always on-the-go.

4.2 Develop the right product

This product needs to be built around ubiquitous access. That means no complex login procedures for different zones, no per-household installation, and no signal drop when you walk 50 meters. Whether someone is in their lounge, the local barber's, or their cousin's yard, they should stay seamlessly connected.

Patchy networks do not succeed. Complexity deters customers. Everyone gets the same fast connection. Everywhere. One product. One experience.

The product is time-based, not usage based. This means users pay for access in clearly defined units—hourly, daily, weekly, etc. It's easy to understand, easy to budget for, and completely avoids the anxiety of data depletion or bill shock. That clarity builds trust, and trust builds loyalty.

By adopting a "pay-as-you-go" model, consumers can access the Internet the same way they already buy goods: in bite-size chunks. No long-term contracts. No upfront investment. Just access when they need it.

Sales should be instant and simple. This is enabled by a digital marketplace that allows people to exchange cash for digital tokens that can be used to buy time-based access.

4.3 Establish a reseller network

In informal economies, distribution is everything. The more touchpoints you have, the more sales you'll make.

Anyone with a digital marketplace account can become a reseller. They purchase access at wholesale prices and sell it at retail. This creates income opportunities in the community and turns resellers into trusted brand ambassadors.

This isn't just sales; this is hyper-local market penetration. These resellers are the voice of your brand. With the right tools and incentives, they'll not only sell your product but help educate the community, promote offers, and provide critical customer feedback.

To grow this network:

- Partner with local leaders to identify entrepreneurial individuals.
- Make it easy to join and start selling.
- Provide simple training and promotional materials.

Ensure pricing transparency and eliminate any room for collusion.

4.4 Create awareness

Your network is only as valuable as the number of people using it. That means awareness from day one should form one of the foundational elements of your plan.

Start fresh with a brand people can trust. Build it on transparency. Use every opportunity to educate how the product works, how to buy it, what it enables, and how it benefits the community.

Education is your most powerful marketing tool. Teach people:

- The difference between time-based and data-based products.
- How to purchase and redeem tokens.
- What they can do online – from job hunting to entertainment.

The best form of education? Experience.

Host activation events in the heart of the community. As your network rolls out, bring your brand onto the streets. Be bright. Be visible. Be memorable. These activation events are where trust is built and feedback flows.

Activation events should:

- Showcase how easy it is to get online.
- Let people try the product with free vouchers or demos.
- Place resellers at the center - enabling them to make live sales.
- Gather insights from users about their needs and behavior.

Make this a habit. Consistency builds momentum. Run weekly pop-up activation events and pair them with online contests. Keep the brand alive and present. Stay top of mind.

In the end, your single metric of success is usage.

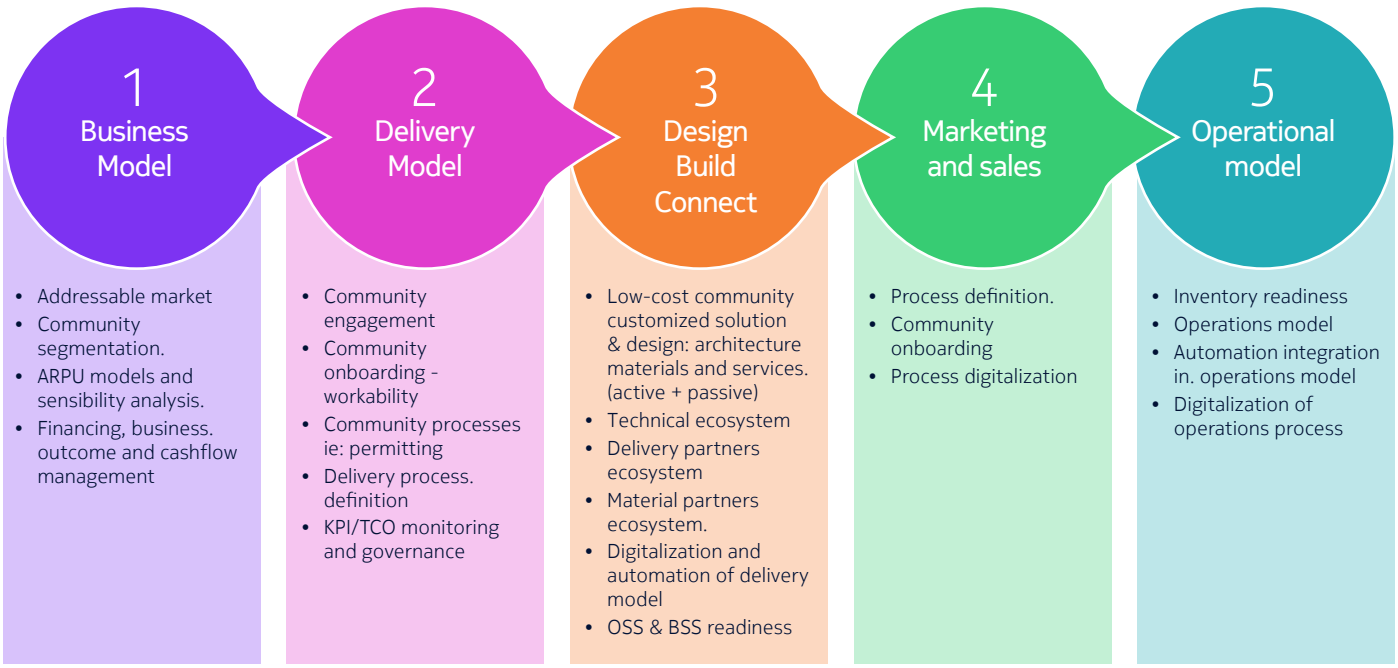
If people aren't buying and using time-based access, you haven't yet reached them.

But once they do, everything changes. Because now, the internet becomes part of their daily life, just like tea bags, sugar, and soap.

4.5 Building a PAYG business

Evolving or adopting this alternative model demands a structured and meticulously planned approach. This encompasses not only precise product definition but also extends to fostering robust community engagement and implementing comprehensive automation for processes and records. Critical to this strategy is the prudent selection and ongoing management of partners, alongside proactive preparation for a scalable and operationally efficient network.

Figure 3 Building a PAYG business



5 The technology

When serving dense, underserved communities, not all broadband technologies are equal. While mobile networks are the default for many users today, they simply can't deliver the capacity, consistency, or affordability needed in this context.

Mobile networks, even 4G and 5G, are not designed for density. In a high-density urban setting, mobile spectrum becomes a scarce and expensive resource. Here's why:

- Limited licensed spectrum means contention between users.
- Each user consumes valuable resource blocks.
- High user concurrency leads to interference and reduced throughput.
- Congestion during peak hours causes latency spikes and service degradation.

That's why mobile networks degrade in performance precisely where demand is highest, in tightly packed communities with many concurrent users.

Fiber, on the other hand, is virtually unlimited and very resistant, providing the long-term asset. Once deployed, a single fiber line can deliver gigabit speeds with consistent performance, regardless of how many people use it.

But fiber by itself is not the full story, users access it through Wi-Fi. And traditional home Wi-Fi has its own limitations.

Most consumer-grade routers are designed for a handful of users in a single home. When placed in high-density neighborhoods, the Wi-Fi signal often doesn't stretch far or handles interference well.

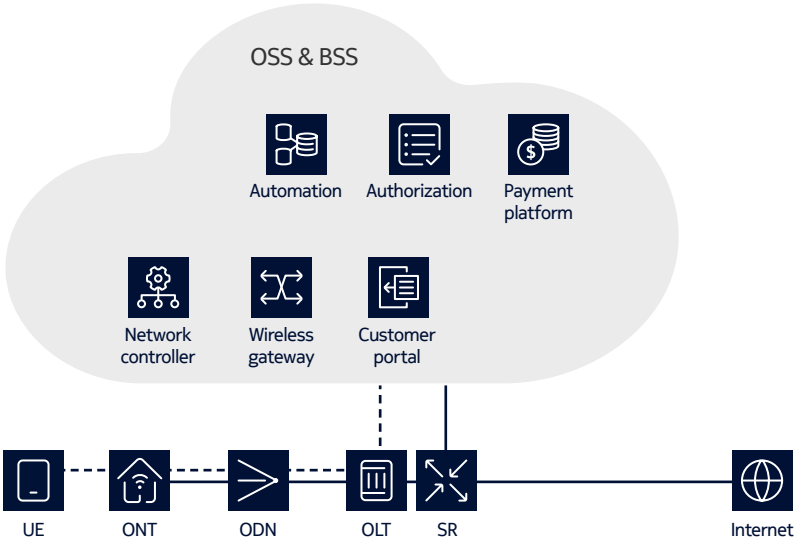
That's where Nokia's solution comes in. By deploying high-quality Wi-Fi routers (ONTs) connected to fiber and placing them close to one another throughout the community, we create a ubiquitous Wi-Fi zone that functions more like a community-wide Wi-Fi cloud, offering seamless, on-the-go access.

What makes this setup exceptional is Corteca, Nokia's Wi-Fi software platform. It transforms a generic router into an intelligent, self-optimizing access point:

- Corteca continuously measures signal quality and adjusts channels to minimize interference.
- It supports advanced features like client steering, band steering, and load balancing.
- In field comparisons, Corteca-based routers outperform generic devices in both speed and coverage.

In the fiber broadband network, Nokia's Lightspan OLT (Optical Line Terminal) equipment delivers scalable, carrier-grade performance. It connects each ONT to the wider network via fiber. The Lightspan OLT's are managed by Altiplano Access Controller.

Figure 4 Pay-as-you-go Architecture



- End-2-end solution
- Tailored to business modell
- Multiple use cases for residential, business, open markets, education, informal transport, etc.
- Modular solution supporting growth and acceleration scenarios
- Flagship devices used to deliver required performance and experience
- Carrier grade VE anchoring
- IPV4 and/or IPv6 with integrated NAT

UE = User Equipment
ONT = Optical Network Terminal
ODN = Optical Distribution Network
OLT = Optical Line Terminal
SR = Service Router
OSS & BSS = Operations and Business Systems.

Nokia's WLAN Gateway provides subscriber specific authentication and management ensuring subscribers can access the required billing and authorization platforms in a controlled manner. The WLAN Gateway also enables users to roam between different ONTs, further enhancing the end user experience.

Together, these technologies enable the creation of a Wi-Fi cloud, a persistent broadband experience accessible across homes, streets, and communal spaces. This is a technological architecture built for density, mobility, and affordability addressing the needs of informal and low-income communities.

5.1 Network design

Consumers choose products based on three things: experience, price, and service - in that order. Therefore, the network must deliver great performance, keep prices low, and scale fast. To do this, design is critical.

Designing in informal or semi-formal settlements isn't like suburban planning. You won't find maps or address lists. You need to first get a real count of households - by walking the streets, using satellite imagery, or working with the community.

Next, identify backhaul options and potential Points of Presence (PoPs). With these inputs, you can start drawing your fiber design.

A good network design should:

- Maximize coverage and throughput.
- Optimize capital expenditure.
- Be resilient against disruption.
- Be modular for phased deployment.

Risk mitigation is part of good design. Fire, vandalism, and civil unrest are real risks in some communities. Design your fiber layout so that:

- Fire in an informal area doesn't affect formal zones.
- Backbone routes avoid high-risk areas when possible.
- Fiber is strung on private property to reduce vandalism risks.

Your network is your most valuable asset. If it's down, your business stops. Design for resilience from day one.

A solid outcome of this phase includes:

- A build-ready network plan with testing protocols.
- Fixed-price or collaborative contracts with fiber contractors.
- Wayleave agreements in place for legal access to build.

5.2 Network build

Execution is where plans become reality. And time is money.

Fiber deployments in medium- and high-income areas are costlier per household. But in dense, low-income areas, deployment becomes much more cost-effective, especially when using aerial fiber on mid-block poles.

Here's how to get the build right.

1. **Choose the right contractors.**

   Go beyond technical competence; align on philosophy. This isn't a normal civil works project. It's community-based, relationship-driven, and often informal. Collaborative contracting works best.

2. **Appoint a local project manager.**

   Someone who understands the culture and can manage stakeholders. Promote aerial builds and minimize trenching - it's cheaper, faster, and less disruptive.

3. **Emphasize quality, documentation, and local jobs.**

   - Document every step for transparency and future maintenance.
   - Create job opportunities for local residents, e.g., fiber hauling, pole planting, customer engagement.
   - Empower local talent: if a task doesn't require a degree, hire locally.

4. **Build in phases.**

   - Test each segment as you go.
   - Survey and build simultaneously - necessary in unstructured environments.
   - Treat each successful build segment as an opportunity to begin selling.

5. **Leverage installation as brand interaction.**

   Each installation has five touchpoints with the resident:

   - Asking permission to plant a pole
   - Planting the pole
   - Stringing fiber
   - Requesting to install Wi-Fi in the home
   - Performing the installation

   Train teams to treat these moments as customer onboarding. Every action should reinforce brand values: fast, affordable, community-first broadband.

6. **Respect the customer.**
    - Let them choose the router location.
    - Leave their home cleaner than you found it.
    - Speak their language - both literally and culturally.
7. **Use the network build as a marketing campaign.**
    - Brand your teams.
    - Use signage and community events to signal the arrival of your service.

Fiber is the only viable way to deliver high-capacity connectivity in dense areas. Overhead fiber on mid-block poles is not only cheaper and faster to deploy, it also enables true community-wide coverage.

For informal areas:

- Use survey-as-you-go approaches.
- Where no addresses exist, use landmarks or birth certificate-style documentation.
- Deploy ONT installation tools that require minimal skills and reduce install time.

This is infrastructure tailored to reality - fast, simple, resilient, and ready for the hustle of the informal economy.

Nokia's Broadband Easy provides a platform and associated services to digitize and automate such a project. It takes a digital-first approach that integrates and automates the deployment for any or all stages of design, build, and connect, lowering costs and enabling faster time to revenue.

5.3 Operations

Nokia cloud-based platforms bring automation into fiber broadband networks, resulting in reduced operational complexity and an exceptional broadband experience.

Altiplano Access Controller

This network automation tool manages and optimizes fixed access services. Its modern cloud-native architecture makes it flexible to customize to operator's needs and easy to expand with smart data analytics and AI/ML diagnostics.

The Altiplano Access Controller provides centralized orchestration for:

- Zero-touch provisioning.
- Real-time service assurance.
- Automated fault detection and resolution.
- Realtime fibre operations with digital twin.

Corteca

Corteca home connectivity software elevates Wi-Fi performance, empowering broadband providers to enhance the customer experience by continuously measuring Wi-Fi signal quality and adjusting channels to minimize interference. It reduces operational costs and increases revenues.

6 Community engagement

Bringing fiber to underserved communities isn't just a technical endeavor, it's also a social one. These are places shaped by resilience, resourcefulness, and a deep sense of community. They are also places where people have every reason to be cautious of promises.

To succeed, we must walk in with more than just tools and rollout plans. We need humility, empathy, and a plan for real collaboration.

This is not just an infrastructure project. It's a trust-building mission. If we get it right, we don't just connect homes, we transform lives. We don't just close the digital divide, we expand the digital economy.

Every deployment is an opportunity to say: "You matter. You belong in the connected world." That begins and ends with the people.

6.1 Connect with the people

The first step is a handshake, not a network diagram.

Engage the community early, openly, and often. This is more than a courtesy; it's how you earn social license to operate. Make time for conversations that have nothing to do with fiber. Ask people about their daily hustle. Their children. Their struggles. Their hopes. Build rapport before you build anything else.

Wherever you already have a foot in the door, use it. Then widen that circle:

- Churches, mosques, temples, etc.
- Taxi associations
- Local entrepreneurs
- Teachers and principals
- Traditional leaders
- Municipal councilors
- Youth groups
- Police and neighborhood forums

These are the structures that govern life in these informal settlements. They can make or break your project.

Take the time to explain what you're building and how it works. Use plain language. Visuals help. Show what success looks like, for you and for them. Be honest about the challenges. Transparency earns trust.

And remember: every conversation should include a simple question—"How can we do this right?"

6.2 Your face in the community

Your most important hire might not be your project manager. It's the person in your team that builds and owns the trust-relationship with the community. This person will turn local goodwill into project success.

This person is your cultural translator, your early warning system, your reality check. He or she understands the undercurrents, the influencers, and the informal dynamics that are not understood outside of the community.

People who demonstrate the characteristics below can be a good representative for your company in the community:

- They're known - respected in the community, with no political baggage.
- They're trusted - someone who's seen as fair, honest, and reliable.
- They're a hustler - entrepreneurial, agile, and always a few steps ahead.
- They care - genuinely committed to improving their community.

This person should be empowered—give them a seat at the table. Let them shape decisions. Your representative will spot problems before they explode. They'll help resolve disputes when things get tense. And they'll become a natural ambassador for your brand.

6.3 Observe local politics

To an outsider, these communities can seem chaotic. But beneath the surface, they operate with complex informal governance systems. It's not written down, but it's very real.

Learn to see the invisible power structures:

- Who do people turn to for help?
- Who has moral authority?
- Who is allowed to make announcements or call a meeting?

Respect those lines. Don't bypass them, even if they seem inefficient. Work with the grain of community life, not against it.

Organize town halls that bring these groups together. Your goal isn't just to inform, it's to co-create. Let the community shape the rollout. Let them ask tough questions. Let them call out things you hadn't thought of.

A successful town hall doesn't end with a signature—it ends with applause.

That's when the tone shifts from "What are you doing here?" to "When can you bring this to my street?"

That shift is everything. It's how you go from outsider to insider. From vendor to partner. From installer to enabler of a digital future.

6.4 Co-ownership and legacy

Don't just enter the community. Embed yourself.

Find ways to create value beyond the fiber:

- Hire locally during the build.
- Train youth in digital skills or basic network maintenance.
- Sponsor local events or community centers.
- Make your Wi-Fi hubs double as digital education points.

Think legacy. Once the last cable is spliced and the routers are blinking, what will the community say about you?

Your goal is simple: they must see you as one of their own.

Because when that happens, something powerful occurs:

- They don't just use your network.
- They protect it.
- They promote it.
- They own it.

And that's when the digital divide starts to disappear—not because you built something, but because you built it with them.

7 More opportunities

It is true that sustainable growth in underserved communities is not achieved through handouts. It's achieved through shared value, where the community doesn't just benefit from the network, but actively participates in building it, running it, and profiting from it.

This isn't a slogan. It's a proven strategy. If you want long-term stability, growth, and customer loyalty, build a network with the community, not just for it.

And when people help build something, they value it more. Psychologists call this the IKEA Effect—the tendency for individuals to assign more value to products they helped create. If a community helps roll out a network, they are more likely to support it, protect it, and promote it.

That's your secret weapon: participation.

7.1 Facilitating community participation

Think of community participation not just as CSR, but as strategic brand investment. Every local hire, every community meeting, every resident engagement is all part of your reputation management plan.

Let people see the project unfold in their name. Let them tell their friends, "I helped build this." That turns an infrastructure rollout into a movement.

7.2 Creating employment and building integrity

One of the greatest economic opportunities in a fiber rollout is job creation. Not just any jobs; jobs that elevate dignity, skill, and ownership. Where possible, always employ locally.

This builds credibility, reduces risk, and injects money into the local economy. It also provides a foundation for financial inclusion. A new income stream creates new savers, borrowers, and digital participants.

Examples of community-based job opportunities include:

- **Community shop branding**. Local painters turn neighborhood shops into vibrant billboards for your product.
- **Permission teams**. Field reps go door-to-door securing build permissions, a powerful blend of sales, compliance, and trust-building.
- **Network construction**. Local labor plants poles and strings fiber with basic training; this becomes dignified work with purpose.
- **Site security**. Local security firms protect build teams, limit vandalism and ensure peaceful execution.
- **Resellers**. Once live, community members resell airtime or data bundles in a trusted face-to-face format.
- **Customer care**. Community reps provide first-line support, trained to resolve issues fast and in the local language.

This kind of job creation doesn't just put food on the table; it restructures economic relationships inside the community. And that, in turn, leads to loyalty, safety, and word-of-mouth growth.

7.3 Elevating education, entertainment, and sport

The network is the foundation. But what it enables is even more exciting. We believe the real path to long-term value lies in three pillars of social impact:

- Education
- Entertainment
- Sport

All three are deeply embedded in township culture. All three drive daily decisions about time, money, and opportunity. And all three are ripe for digital reinvention.

We're building a pay-as-you-go digital content platform to deliver services like:

- Micro-insurance
- Online learning modules
- Local entertainment and video content

Interactive sport coverage and community games

And we're doing it in a way that fits how people actually live and spend.

7.4 Why pay-as-you-go Is the future

The internet doesn't have a connectivity problem. It has a pricing problem. Too much of the content people want, from Netflix to e-learning platforms to healthcare portals sits behind credit-card-only, monthly-subscription paywalls.

This works fine for the top 10% of the market. But for everyone else, it's exclusion by design.

The answer? Pay-as-you-go access to digital products. No credit card. No long-term commitment. Just:

- Buy what you can, when you can.
- Use it instantly.
- Come back for more when you're ready.

This is how the informal economy already works—from mobile airtime to electricity to transport. So let's meet people where they are. Let's price the internet like a taxi ride that is accessible, on-demand, and priced in small, manageable bites.

7.5 The business model behind it

Digital content scales beautifully. Once you've made a video, a course, a product, it costs the same to deliver it to 10 people or 10 million.

These are called sunk costs, and they work in your favor, if you can access enough users.

But here's the problem with today's model. Because most of the population is locked out of subscription-based services, platforms have to charge more to the few who can afford it. This drives up retail prices, which further excludes the rest. And the cycle continues.

Pay-as-you-go flips that script.

By enabling casual access at a lower price point, we expand the addressable market. And as more people join, the economics improve for everyone.

It's the virtuous cycle of scale:

1. Lower prices bring in more users.
2. More users justify more investment.
3. More investment enables better content and services.
4. Better content attracts even more users.

And so it grows.

7.6 The bigger picture

This is not just about fiber. It's about building a more inclusive internet where digital opportunity is not reserved for the rich or urban elite.

With fiber as the foundation, and community as the partner, we can:

- Enable micro-entrepreneurship.
- Improve financial literacy and inclusion.
- Deliver culturally relevant digital experiences.
- Spark hope, ambition, and growth in places that the traditional telecom model left behind.

This is where profit meets purpose. This is how the informal economy becomes a digital economy. And this is how we create more opportunities, for everyone.

8 Conclusion: turning potential into progress

We've shown that the informal economy is not a side market, it's the main event. It's where the majority of people in Sub-Saharan Africa, Asia and South Americalive, earn, and spend.

For too long, this segment has been underserved by traditional fixed broadband models. But with the right technology, business model, and community approach, this market becomes not just viable, it becomes transformational.

Key takeaways:

- Fiber is the only infrastructure capable of delivering scalable, high-performance connectivity in densely populated, economically constrained communities.
- Affordability isn't just about price, it's about matching the cash flow patterns of customers with flexible, pay-as-you-go services.
- Local involvement is key. From network build to product resale, employment and community participation drive brand loyalty and operational resilience.
- New digital models like bite-sized content, micro-payments, and usage-based billing unlock massive new addressable markets for both service providers and digital service providers.

This is not a philanthropic exercise. This is a business opportunity grounded in real economics, with the potential to:

- Lower per-home deployment costs through aerial fiber and local labor.
- Increase take rates through ultra-flexible pricing models.
- Deliver measurable social impact alongside commercial returns.

8.1 This is the call to action: let's test It

It's time to move from theory to action. We invite service providers, ISPs, content providers, and ecosystem partners to test this model with Nokia. Here's how to get started.

Step 1. Market study

- Choose one high-density, low-income community.
- Understand income patterns, mobility, and digital habits.
- Define your go-to-market footprint: 1,000 to 2,000 homes (ONTs).

Step 2. Product strategy

- Define 1 to 4 packages aligned with cash flow realities:
  - 1-day access (perfect for data-on-demand buyers).
  - 3-day access optimized as a weekend special (sports and other online entertainment)
  - 7-day pack (for households with informal but semi-regular income).
  - 30-day pack (targeted at more stable earners or households with pooled resources).
- Add optional bundles for digital content (education, entertainment, insurance, etc.).

Step 3. Model the business case

- Use Nokia's tools to simulate uptake, ARPU per ONT, ROI, and break-even timelines.
- Build in realistic assumptions for take-rate ramp-up and usage variability.

Step 4. Execute a 3-month pilot

- Build the network using aerial deployment and community labor.
- Appoint a local community liaison and train field teams.
- Leverage Nokia OLT, ONT, and Corteca OS to guarantee Wi-Fi quality, even in complex indoor environments.
- Use Altiplano and Wi-Fi cloud management to monitor, troubleshoot, and adapt in real time.

Step 5. Track KPIs

Here's how you'll know it's working:

- Revenue per ONT per day (core commercial metric).
- Average daily users per ONT (usage intensity).
- Take rate evolution (adoption curve).
- Service uptime and support tickets (network and customer experience health).
- Referral rate or NPS (brand performance).

Feed these insights back into your business model and prepare to scale.

When scaling, Nokia can support your full operations with the tools and experience to digitize and automate more of the business to enable a truly scalable operation by using the Nokia Broadband Easy solution.

8.2 Let’s build the future together

A digital future of informal economies will be built at the intersection of infrastructure, innovation, and inclusion. The solutions that thrive will be the ones that match world-class technology with the needs of the everyday customer.

Nokia is ready to help you unlock this opportunity with the tools, the tech, and the track record to make it work.

Let’s test it. Let’s prove it. Let’s scale it.

And together, let’s connect the next billion.

About Nokia

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