Caribou Digital

Bank agent-based Wi-Fi trial in Africa: Lessons learned for the satellite industry

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Executive
summary

Listed below are the high level learnings to the satellite industry from the past year of piloting Wi-Fi access via satellite across Kenya at selected Equity bank agent shops/schools.

Context

Project success in emerging markets requires a keen understanding of the local context, which includes a strong grasp of potential geographical, cultural and socioeconomic barriers towards access.

There are potentially other reasons outside network coverage that explain why Internet adoption rates are low – our research suggests that there are both supply side and demand side barriers that influence uptake.

Users living in predominantly urban areas were more comfortable discovering and navigating the service than users in predominantly rural areas who required more assistance and training.

Project background

As part of the International Partnership Space Programme (IPSP), the UK Space agency designed a grant programme to test out different business models that could deliver tangible economic benefits from the use of UK satellite technology to countries that currently do not maximise these benefits and to generate a bridge between the UK space sector and emerging countries.

The UK Space agency awarded a consortia of partners (Inmarsat, Equity Bank, Dalberg, Caribou Digital, Satellite Catapult and BRCK) a grant for the I-Sat Connection Programme to develop and test the business case using satellites through an agent network model across Kenya.

The consortia provided cached content Wi-Fi access to 200 agent sites in areas where there is both strong and poor 3G coverage.

Operational implications

Service delivery: Equipment used must be industry tested and proven to avoid technical issues later in the pilot and recommend using solar power in rural areas.

Service provisioning: Depending on geography and customer's browsing experience, some customers prefer accessing curated content via a cache than through open Wi-Fi. Though young adults (17-24) were the most comfortable navigating the service, they were not as interested in restricted Wi-Fi access as older adults (45+) who required more assistance but appreciated navigating through curated content.

Value of service: The service offered both financial (~10-20 new customers per day) and social benefits (increased prestige through information dissemination) to the agent.

Executive
summary

Commercial implications

Approaches towards commercial modelling: To maximise the effectiveness of the commercial model, minimise the number of macro assumptions to strengthen the predictive value. For this project, we opted to use a unit economic analysis instead of a Net Present Value to evaluate commercial viability because of its simplicity.

Cost/Benefit: Connecting unconnected rural communities using satellite is

– More cost affordable than building new cell towers to extend their network coverage.

– Faster to deploy (within 3 months) than constructing new cell towers (1-3 years).

Need for innovation/subsidisation: CAPEX and OPEX still requires innovation and subsidisation - to help defray costs, explore innovative business models to help reduce OPEX, along with internally subsidising rollout from other internal business units and exploring outside investment to subsidise initial rollout.

UX Implications

Site visits conducted throughout the pilot suggest a hierarchy for user experience where lower-level needs, although functional in nature, must be met before higher-level needs, which are more emotional, can be achieved.

The base, foundational UX need – accessibility – focuses on issues that may prevent users from accessing the portal, such as hardware outages and unreliable connectivity.

The middle UX need – usability – focuses on issues that relate to the user's ability to easily interact with the interface, such as using clear and easily understood iconography and content for different customer segments.

The final UX need – usefulness – focuses on issues that relate to the user's perceived value of the product/service experience and of the brand, such as offering interesting, entertaining and relevant content for the user that address a particular need or want.

Considerations for the satellite Industry

Market opportunity: Satellite connectivity can quickly and cost effectively connect rural and remote locations to the Internet more efficiently than market alternatives.

Additionality of satellite: Satellites are uniquely positioned to unlock demand for the Internet in these unconnected areas but will require support and resources from key commercial and policy partners to address supply and demand barriers to access.

Product design: The technology needs to be durable, rugged and require low power to effectively provide connectivity to these geographies.

Conditions for success: In its current design, Internet access from satellites may not offer the user experience that frequent Internet users are accustomed to (i.e., fast and open access), so it is critical to set expectations with the targeted customer demographic.

Commercial opportunity: Unlocking demand for internet access to previously unconnected regions may be costly and require a longer timeline towards commercial viability.

Emerging market
context

Market potential

Of the 3.8 billion unique mobile subscribers worldwide, only 40% utilise mobile broadband (3G and 4G) connections, in 2014.

Emerging markets represent regions with the highest growth potential – using Asia as an example:

– 33% of the population use mobile Internet via 3G/4G

– 39% of the population live within 3G/4G coverage but do not use mobile internet

– 28% of the population live outside 3G/4G coverage

Connectivity challenges for rural communities

The lack of network infrastructure remains the dominant supply side barrier in extending mobile and Internet access to the rural areas, where only 29% of the population has access to 3G compared to 89% in urban areas.

This barrier to rural access is driven by the high cost of deploying infrastructure and the poor returns associated with rural regions of emerging markets.

Typical average revenue per user (ARPU) per unique subscriber in Sub-Saharan Africa is US$11.6 (2013) which is insufficient to support the CAPEX and OPEX to extend GSM networks into rural areas.

The economics of mobile network deployment is based on a target Return on Investment (ROI) dependent on the costs of building (CAPEX) and operating (OPEX) network infrastructure (towers, radios and backhaul) balanced with the revenues from subscribers within the tower's coverage area. Network operators typically expect to recoup infrastructure investments within 2-3 years, which is likely too aggressive in low-income, rural regions with these low ARPUs.

Sources

GSMA Intelligence. Posted at https://gsmaintelligence.com/. Accessed December 2015.

GSMA, "The Mobile Economy: 2015". March 2015.

ITU. "ICT Facts and Figures - The World in 2015." Posted at http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2015.pdf. Accessed December 2015

ARPU consists of mobile operator voice, messaging and data revenues, and not from apps and advertising that will drive revenue for over-the-top players.

Emerging market
context

Barriers to adoption

Barrier: affordability

The daily wages of the poor – the 1.3 billion living on less than $1.25 per day and 2.5 billion people living on less than $2 per day – makes it difficult to afford mobile ownership.

Whilst device costs have plummeted to around US$15 for a basic smartphone, the total cost of ownership remains high. Device charging for off-grid users can cost upwards to $.25 per charge while pre-paid data plans can cost up to 10% of monthly income.

Barrier: Local content and services

Despite the worldwide spread of the Internet, content and services are more readily available, more diverse, and likely of higher quality in a few dozen of major languages then they are across the long tail of 6000 specialised, regional languages in use around the world.

According to the World Bank, at least 80 percent of all content on the Internet is in one of ten languages, and 54% is in English. The full linguistic, contextual, and cultural diversity of the world is not reflected in the diversity of content and services available online.

Barrier: Language and digital literacy

Language literacy is critical to using mobile and Internet and is a constraint to getting the nearly 774 million illiterate adults, majority of whom are in emerging markets, connected.

In addition to digital literacy, proficiency with the use of digital technology, is critical. The path to digital literacy begins with an awareness and interest in the use of mobile and Internet services. In India 69% of respondents cited lack of awareness as the main reason for not using the Internet.

Sources

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Equity trial: Background, context and project design

IPSP I-Sat connection programme goal

To deliver tangible economic benefits from the use of UK satellite technology to countries that currently do not maximise these benefits and to generate a bridge between the UK space sector and emerging countries. The Kenya/Equity project was one of the pilot initiatives explored in the programme.

Key objectives

Improve access to digital services
To use Inmarsat's mobile satellite capabilities for the provision of high quality digital services to drive economic growth in emerging markets.

Develop evidence base for new business models
To strengthen the evidence base, define and test new innovative commercial models that demonstrate the critical role of mobile satellite communications in supporting inclusive digital economies in emerging markets.

Grow the space industry's role in emerging markets
To share the research, case studies and knowledge from the project to grow the overall industry, allowing others to follow up on our experiences and build from them.

Project background

As part of the International Partnership Space Programme (IPSP), the UK Space agency designed a grant programme to test out different business models that could deliver tangible economic benefits from the use of UK satellite technology to countries that currently do not maximise these benefits and to generate a bridge between the UK space sector and emerging countries.

The UK Space agency awarded a consortia of partners (Inmarsat, Equity Bank, Dalberg, Caribou Digital, Satellite Catapult and BRCK) a grant to develop and test the business case using satellites through an agent network model across Kenya, the I-Sat Connection Programme.

The consortia provided cached content Wi-Fi access to 200 agent sites in areas where there is both strong and poor 3G coverage.

Equity trial: Background, context and project design

Programme partners

Partner	Role	Value proposition
inmarsat	**Consortium lead** — Expertise in space-based communications and technology	'Inmarsat leads with unparalleled expertise in global satellite communications'
Dalberg	**Strategy in Africa and emerging markets** — Strategic direction and planning — Footprint across over 45 countries in Africa — Innovation, technology	'Dalberg delivers strategic direction and innovation to maximise impact across Africa'
	Digital services and architecture — Experience defining and analysing digital economies in emerging markets	'Caribou drives end-to-end architecture and community management to build digital economies in emerging markets'
CATAPULT	**Application research and design** — User application research to pilot development — Dissemination to drive applications growth	'UK Satellite Applications Catapult facilitates collaboration and best-practice sharing to advance the space industry'

Equity trial: Background, context and project design

Anchor partner in Kenya – Equity Bank

Equity Bank and Equity Agency Banking

Equity Bank has more than 8 million customers making it the largest bank in terms of customer base in Africa and having nearly half of the bank accounts in Kenya.

Equity has a strong social focus and aims to empower its clients to transform their lives and livelihoods.

Equity Bank Kenya has an agent network of over 17,000 agents.

Equity Group Foundation

Equity Group Foundation is the home of the Group's social initiatives and investments. Famously known for "Wings to Fly," the largest secondary school scholarship programme in Africa, the Foundation has 6 thematic focus areas:

Education and leadership; Financial literacy and Access; Agribusiness; Environment and sustainability; Health; and Innovation and entrepreneurship.

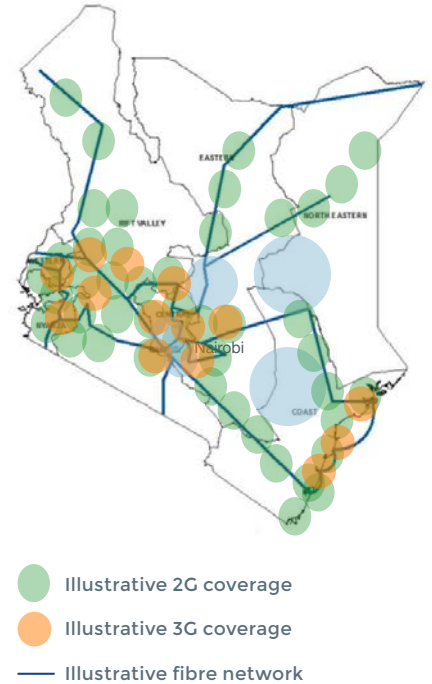# Equity trial: Background, context and project design

Kenya context

The national fibre infrastructure links many of the urban centres in the southwest of the country and the coastal southeast but becomes more sparse in the more rural areas of the north and east.

2G coverage is widespread across urban and rural regions while 3G coverage is limited to the main urban centres e.g. Nairobi.

As illustrated in the network connectivity map in Kenya, much of the Kenyan population centred in urban and per-urban hubs have access to fibre, 2G and 3G while remote and rural areas in the North and in the East have poor/no coverage.

Need for innovation/subsidisation: CAPEX and OPEX still requires innovation and subsidisation - to help defray costs, explore innovative business models to help reduce OPEX, along with internally subsidising rollout from other internal business units and exploring outside investment to subsidise initial rollout.

🟢 Illustrative 2G coverage

🟠 Illustrative 3G coverage

—— Illustrative fibre network

Equity trial: Background, context and project design

The Equity pilot project

Rural areas will continue to lack connectivity until a strong business case emerges that will justify the infrastructure costs necessary to reach them.

We hypothesised that by using existing satellite and Equity's agent network, we could provide a more viable business model for rural areas.

To explore this, the UK Space Agency provided the Inmarsat and Equity Bank consortia a grant to develop and test the business case using satellites through an agent network model.

In this pilot phase we deployed satellite Wi-Fi portals at sites across Kenya including, supermarkets, schools, AgroVets, retail shops, cosmetics salons, restaurants, and more.

We used a mainly cached content model (with some white listed web sites), with the Wi-Fi portal, Equitel MyLife, to deliver selected content to agent's and customers.

Topics included agriculture, banking, business, education, entertainment, health, and news.
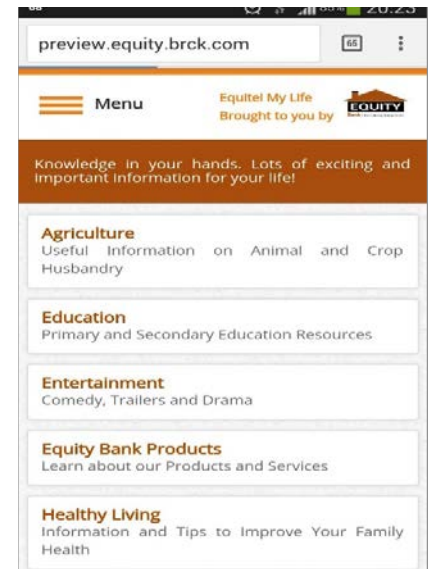
Equitel MyLife homepage

Agent installed Bill of Materials used in the project with BGAN and internal system box

Equity trial: Background, context and project design

Agent site selection criteria

1   Equity branch network
All pilot sites are attached to Equity bank branches.

2   Successful core commercial business
As part of the registration process all agents demonstrated that their core commercial business has sufficient resources to support an agency banking business.

3   Mix of connectivity
The pilot targeted a mix of sites with 2G and 3G. Sites with 2G only were defined as having limited connectivity and sites with 3G were defined as having strong connectivity.

4   Geographic dispersion
Sites were chosen randomly from Equity's established agent cluster groups, yielding a variety of geographies spread across rural, peri-urban and urban sites.

5   Control and backup group
Sites were chosen as the control group for research and comparison purposes with additional back-up sites should any of the pilot sites prove unsuitable.
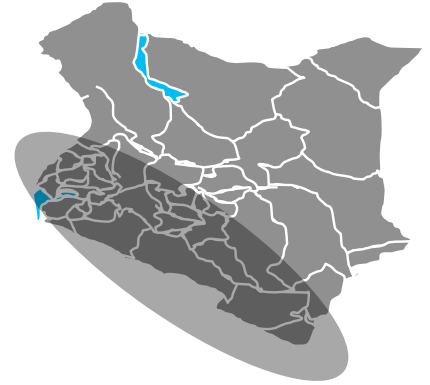
Target region for pilots

Equity trial: Background, context and project design

Agent service offering

We explored two different B2C content services and researched into a third B2B service for the pilot (see appendix for additional details):

– **Digital content at Equity agent shops.**
Equity group cached digital content for financial services, entrepreneurship, health, agriculture, education and news at participating agent locations for free access to all customers.

– **Digital educational content at Equity-supported schools.**
Schools were provided access to online learning and teaching websites.

– **An Enterprise Resource Planning (ERP) platform**
The platform would help Equity agents improve management of backend processes. The service offered to help agents manage data and information flow about their inventory and transactions flow as well as on their customer base.

Lessons learned
– Operational model

Overview: Operating model

Business proposition	Delivery	Sustainability
– Content offering – Cache Vs. open Wi-Fi – User experience	– Equipment	– Training/Marketing – Key partners – Monitor and evaluation

Key activities

As a framework, we recommend adopting Alexander Osterwalder's Business Model Canvas[1], a popular template used to identify core aspects of a business model that are critical to success.

In the next section, we highlight the key findings for the satellite industry along with a discussion around best practices for setting and monitoring key performance indicators.

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1 http://alexosterwalder.com/

Lessons learned
– Operational model

Operating model: Business proposition

Users viewed entertainment content the most, followed by news, education and agriculture content.

Users appreciated the high speed of cached video content but quickly lost interest with the overall service when the content had not been refreshed.

For future efforts, consider using a content management system that uses data analytics to manage the content selection and content updates throughout the network.
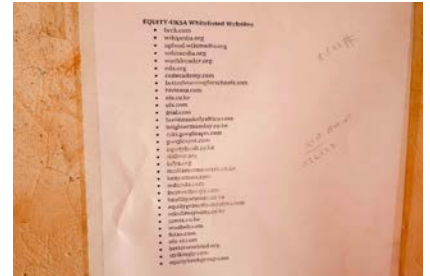
Content offering

Users had varying experiences with browsing the Internet, with youth customers (17-24) as the most proficient while older customers (45+) the least proficient with navigating and browsing.

Older customers had trouble understanding how to log into the service and navigating the different content offerings; to help with their onboarding, consider offering an instructional video to orient around the platform while using widely understood images and icons as guides for the service.

User experience

Lessons learned
– Operational model

Operating model: Caching vs. open Wi-Fi

Listed below are considerations needed in exploring what type of Internet experience satellite companies should provide – Cache vs Open Wi-Fi.

Open Wi-Fi

User experience
Users will have a full and comprehensive browsing experience with no access restrictions but the high latency with geostationary satellite access may make the service unattractive to new users.

Cost
The CAPEX will require a faster data compressor to improve the user experience, which will make it considerably more expensive, while the OPEX will be more expensive because of high data rates for usage.

Cache

User experience
The limited content offering will appeal to novice Internet users who would prefer the comforts of a limited and curated experience but not to regular Internet users; however, both novice and regular users will prefer the fast user experience in accessing videos over the cache.

Cost
The CAPEX for cache access will use a more affordable data compressor than that for open Wi-Fi, while the OPEX could be more expensive given the need for a content manager to update and adjust the cache content.

Lessons learned
– Operational model

Operating model: Delivery

The solution was put together especially for this project and included a mix of proven and – to help reduce costs – unproven production grade equipment.

The local Kenyan supplied Wi-Fi Access point equipment was roughly ~65% of the next supplier's price, however it suffered from frequent technical problems that impacted the overall system availability.

The key learning is, in these harsh environments stick with production grade and proven equipment even if the up front cost is higher.

Additionally, ensure that solar power is included in the set of equipment for areas where the power grid is not stable and that quality support is in place and preferably integrated into existing structures.

Equipment

Lessons learned
– Operational model

Operating model: Sustainability

Agents across the Equity network appreciate the service in different ways, as some saw it as an opportunity to sell other services that cater to Internet browsing while others appreciate the added prestige within the community.

To help promote the value of the service to agents, we recommend sharing best practices from agents who successfully commercialise the service across the network to help other agents commercialise the offering.

Value proposition: Agent

Users who accessed the Wi-Fi service for the first time often misunderstood the service as free Wi-Fi rather than restricted Internet access. This confusion often led to disappointment and in some cases, lack of engaged usage.

To address this, consider a marketing strategy where visual collateral in the stores clearly articulates and differentiates the service offering while engaging user interest at the community level.

Marketing

Lessons learned
– Operational model

Operating model: Sustainability

Partners are critical in helping deploy and provide connectivity to rural consumers – listed below are important lessons to consider:

Partnership selection: There are two categories of partners that are critical in providing satellite access in rural communities

— Commercial partners: Cultivate partnership with organisations that can help commercialise the offering (content, technology, UX, learning)

— Ecosystem partners: Generate partnerships with key NGO's, donors and the government to help address the different barriers for rural access

Commitment: Ensure that the organisations selected are properly incentivised to commit comparable amounts of time and/or resources throughout the project

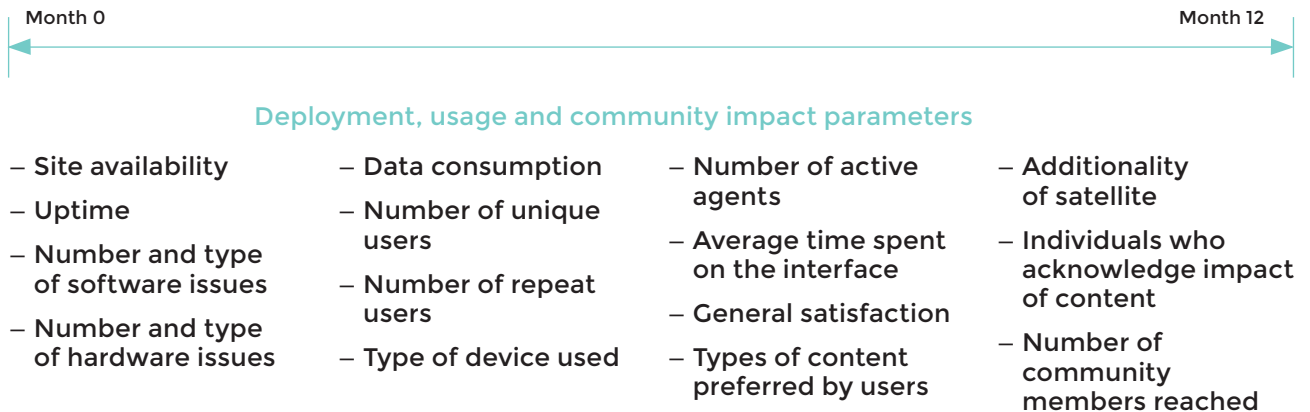Process: Commit to weekly/bi-weekly meetings with the partner organisations throughout the project

Partnerships

Lessons learned
– Operational model

Operating model: Sustainability

Under the first year of deployment, we suggest monitoring and evaluating performance against the following set of KPI's.

Month 0 ←————————————————————————————————→ Month 12

Deployment, usage and community impact parameters

– Site availability	– Data consumption	– Number of active agents	– Additionality of satellite
– Uptime	– Number of unique users	– Average time spent on the interface	– Individuals who acknowledge impact of content
– Number and type of software issues	– Number of repeat users	– General satisfaction	– Number of community members reached
– Number and type of hardware issues	– Type of device used	– Types of content preferred by users	

Proper monitoring and evaluation analysis requires a blend of quantitative (back-end data analytics) and qualitative analysis (field research) to properly understand the nuances of user behaviour.

To maximise its effectiveness, we recommend the following:

Embed M&E into core processes of the implementation partner: This will ensure that there is staff and resources dedicated to monitor, evaluate and based on data analysis, adjust and improve the service offering to customers.

Ability to pivot: Cost and technical challenges may occur that could disrupt the flow of data analysis; to prevent this from happening, it is important to be able to quickly adjust and make a programmatic pivot away from the challenge and into a new and potentially interesting area of evaluation.

Lessons learned
– Commercial model

In this section, we will review the following:
– Different services explored for commercialisation in the Equity pilot
– Methodologies towards calculating commercialisation
– Considerations for scale

Commercial options

The following options were explored as potential Wi-Fi services to offer Equity customers.

Revenue sources: Potentially viable device services

Self-improvement cached content	Premium cached content	Whitelisted live websites	Access to Wi-Fi services	Reliable connectivity for POS
Content focused on health, education, personal finance, and skill-building (eg. Wings to Fly Learning)	Content focused on current news, sports, and entertainment	A selection of ~10 whitelisted live sites (e.g. Hivi Sasa, Goal.com, Wikipedia)	Open access internet services, with little-to-no restrictions on sites visited	Reliable connectivity to conduct financial services using wireless POS devices.

These four options were explored as part of the pilot; the fifth option was not considered due to equipment limitations.

Lessons learned
– Commercial model

Calculating commercialisation

Components for calculating unit economies

Costs	Revenue	Unit economics

Key components

Costs include:	Revenues include:	– Profit analysis comparing total costs against total revenue per site
– **Data fees (rates + usage estimates)** – **Support** – **Hardware**	– **Data resell** – **Growth in other banking services** – Customer usage fees – Third party fees – Rental fees for equipment	

One commercial modelling framework to consider is assessing profitability through unit economics (i.e., calculating profit per site).

Components for calculating unit economies

Costs	Revenue	Unit economics	Deployment schedule	Net present value

Key components

Costs include:	Revenues include:	– **Profit analysis comparing total costs against total revenue per site**	Taking the size of the network and calculating a reasonable deployment schedule for site roll-out	Expanding the unit economic analysis across the Equity network while factoring in the deployment schedule
– **Data fees (rates + usage estimates)** – **Support** – **Hardware**	– **Data resell** – **Growth in other banking services** – Customer usage fees – Third party fees – Rental fees for equipment			

Another commercial framework to consider is evaluating profitability by calculating the difference between the present value of future case inflows and outflows.

To do this we would need to better understand the size of network and deployment rate as they both influence costs and revenues.

The network size and deployment capacity were not available for this project.

Note: Items in bold were modelled in our commercial model analysis.

Lessons learned
– Commercial model

Revenue streams

Description	Commentary
User pays Equity a one time or subscription fee	Free Wi-Fi services are emerging across tightly concentrated regions in emerging markets, making it challenging to develop a business case for a service that an user could access for free. Because of this, we opted to not model a user pay revenue stream.
The agent pays Equity a monthly access rate	Agents saw commercial value with offering the service as it improved their prestige in the community and offered an additional outlet to sell ancillary services. Because of this, we modelled agent pays as a revenue stream.
A third party pays Equity an advertising fee to market on the platform	Research and expert interviews suggested that third party organisations currently struggle to monetise digital advertising in emerging markets given the small market audience. Because of this, we opted to not model a third party pays revenue stream.
The agent pays Equity a rental fee for equipment	Equity could charge agents a rent to buy fee for all of the satellite and network hardware (note: it is likely too expensive to recoup CAPEX entirely from the agent so consider charging a partial rental fee). In our model, we included a separate scenario where we calculated equipment fees as a revenue stream.
Equity generates revenue from other banking services	Equity could market their other products and banking services to customers on the platform. Due to limited data available, we were unable to model this revenue stream.

Project based costs

Costs	Description
Data fees	We used Inmarsat's rates and estimated usage through the analytics generated from the pilot.
Operations	Operation costs included installing, testing and maintaining the hardware, along with marketing/ branding fees.
Equipment	Equipment costs included the satellite equipment (BGAN, bill of materials – xiplink, battery, wiring and casing) and the wireless access point.

Lessons learned
– Commercial model

Approaches to commercialisation

The limited revenue potential in providing Wi-Fi access in remote geographies makes it challenging to recoup the high CAPEX and OPEX for satellite – listed below are three approaches that can be explored to help:

1   Internal subsidisation: An implementing partner may use a blend of technologies to connect their entire network – if that is the case, consider subsidising satellite roll-out through the profits from lower cost technologies.

2   Phased investment: Explore grant and/or private investments to temporary subsidise the costs.

   – Phase 1: Proof of concept: Pursue funding to fully subsidise the CAPEX and OPEX while exploring various revenue streams to show revenue potential.

   – Phase 2: Growth: Pursue funding to subsidise CAPEX while using revenues generated to cover OPEX.

   – Phase 3: Scale: Pursue funding to run CAPEX/OPEX costs and rely on revenues generated to self-sustain capital and operational costs.

3   Cost reduction strategies: Explore innovative approaches to reduce the cost of satellite backhaul – suggestions include:

   – Research and development into more cost affordable equipment.

   – Explore innovative data packages by smoothing out load on network.

   – Offloading traffic to quieter/slack times.

Considerations for scale

If the commercial case for offering satellite connectivity exists, consider the following:

Cost: How expensive will deployment be and would it be more cost effective to use another technology? Would it be more cost effective to deploy to another region? Why/Why not?

Reach of the service: How many users could potentially interact with the solution and provide usage data? How likely are they to become early adopters?
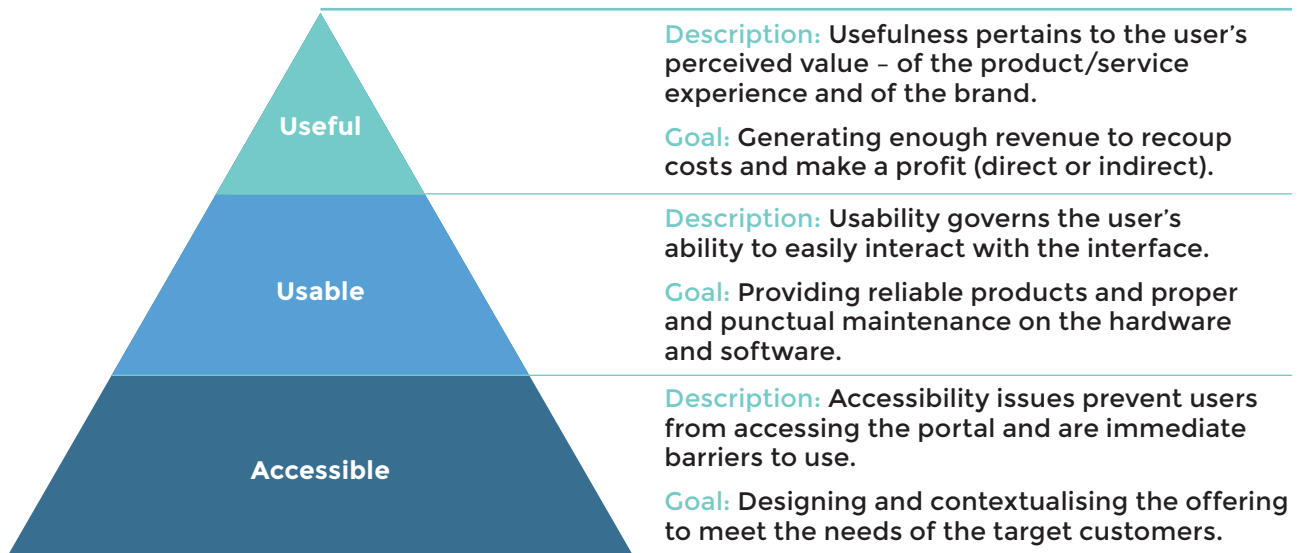
Lessons learned
– User experience

Overview: User experience

The year long pilot revealed several key learnings for a satellite provider looking to provide a content based Wi-Fi solution:

– Framework to approach UX

– Key considerations in the UX framework

– Willingness to pay for the service

UX framework

Inspired by Maslow's Hierarchy of Needs pyramid, the hierarchy of User Experience suggests that lower-level needs, although functional in nature, must be met before higher-level needs, which are more emotional, can be achieved.

Useful	**Description:** Usefulness pertains to the user's perceived value – of the product/service experience and of the brand.
	Goal: Generating enough revenue to recoup costs and make a profit (direct or indirect).
Usable	**Description:** Usability governs the user's ability to easily interact with the interface.
	Goal: Providing reliable products and proper and punctual maintenance on the hardware and software.
Accessible	**Description:** Accessibility issues prevent users from accessing the portal and are immediate barriers to use.
	Goal: Designing and contextualising the offering to meet the needs of the target customers.

Source: Dalberg's Design Impact Group (DIG).

Lessons learned
– User experience

UX considerations

Accessibility

Offering a cached content service can be misunderstood as providing open Wi-Fi, which can lead to a spiral of negative assumptions and a lack of engaged usage when the customer realises the service isn't what they expected.

To address that, accurately communicate the service offering and demonstrate its value through early-stage marketing and community socialisation activities/materials that prime potential customers for the experience.
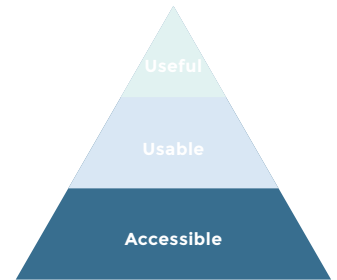
Usability

There's a wider spectrum of comfort in navigating the Internet among emerging market Internet users. For novice users who may elect to use the cached content portal, they may struggle to understand the breadth of content available and how to navigate around the portal without proper instructions, clear and easy to understand iconography.

To address that, provide a short tutorial video that visually explains what is available and how to navigate around, and use commonly and widely understood icons and captions to help new users identify the content available.
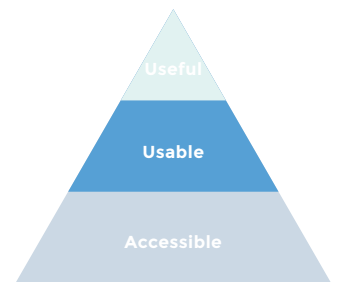
Usefulness

The cached content available for browsing must be interesting and appeal to a wide array of customers and demographics. Moreover, the content provided must be refreshed regularly so that it does not become stale and outdated.

To address that, use a content management system that will source, manage and refresh content based on preselected key performance indicators and usage patterns.
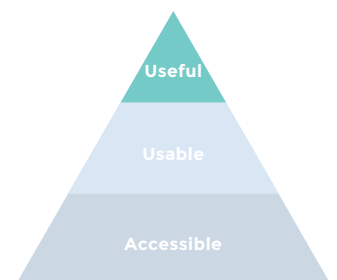
Lessons learned
– User experience

Willingness to pay: Providing the service

Several factors influence whether or not someone is willing to pay to provide the service:

— Subscription costs: Providers are cost conscious and want to see value for their investment.

— Operational costs: Providers are keen to eliminate costs that might be superfluous to their core business.

— Prestige: Providers may elect to pay if they believe the service would improve their brand and reputation within their community.

— Safety: Providers might be nervous to provide the service if they believe the service would bring in unwanted traffic.

Willingness to pay: Consuming the service

Several factors influence whether or not someone is willing to pay to consume the service:

— Alternatives: Customers may be less willing to pay for the service in areas that offer more affordable and less restrictive access to the Internet.

— Value to the customer: The content provided must offer some intrinsic value to the customer, whether that is through entertainment or livelihood.

— Speed of access: Customers may elect to pay for the service if the content is valuable to them and can offer a faster, more pleasant user experience.

Conclusion
– Key considerations for the space sector

Overview

We identified five critical lessons from the Equity trial that should be considered by the space industry:

– **Market opportunity:** What is the unmet demand or market gap that the programme tries to address?

– **Additionality of satellite:** How is satellite technology uniquely positioned to address connectivity challenges in the market context?

– **Product design:** What product and ecosystem design features are required to create a user-centric service?

– **Conditions for success:** What capacity is required to deliver a successful satellite-enabled product/service in the given context?

– **Commercial opportunity:** What is the commercial viability/sustainability of the programme and how can it be enhanced?

This section will evaluate the pilot against each of these lessons and offer broad lessons learned for the space industry.

Conclusion
— Key considerations for the space sector

Evaluating market opportunity

Market opportunity – Equity trial

Using 3G as a metric for geographic reach of Internet access: roughly 70% of Kenyans live within existing 3G coverage while roughly 90% live within 2G coverage.

However, consortia led field research suggested that the strength and reliability of coverage in peri-urban and rural areas is poor and inconsistent.

There is therefore a market opportunity (albeit a lower opportunity to other unconnected markets) to use satellite and connect more Kenyans onto a more reliable network in poor coverage areas.

Market opportunity – lessons learned

Internet users generally access the Internet in two ways – off a fibre connection or through the GSM network and generally off 3G or LTE. Both options require a strong business case to justify the high CAPEX and OPEX needed for deployment.

Market opportunity for satellite connectivity exists in areas where there's potentially a strong business case but has yet to be thoroughly explored by GSM and fibre providers due to cost or geographic constraints.

Evaluating additionality of satellite

Additionality of satellite – Equity trial

Satellite connectivity was expected to provide reliable and consistent access to curated content in pilot sites across urban, peri-urban and rural areas in Kenya.

Content would be refreshed based on usage patterns determined through analytics and an estimated timeline.

Due to issues with the locally supplied equipment used in the pilot, the connectivity was inconsistent and less reliable than existing network connectivity and the content was refreshed irregularly.

Additionality of satellite – lessons learned

Satellite connectivity is currently uniquely positioned to be the low cost option for connecting rural areas where there is poor or no mobile or fibre connectivity.

Cached content is a good model to reduce bandwidth usage, while an open Internet browsing model can be challenging for some sites given the high latency concerns.

To address this, the space industry should use 'optimisers' where possible and explore technical and business model innovations that can speed up the browsing experience, reduce bandwidth usage (and hence cost).

Conclusion
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Evaluating product design

Product design – Equity trial

The equipment chosen for the trial had either been industry tested in emerging markets or had been advertised as a low cost alternative designed for the emerging market; however, solar technology was not used because of the high costs.

To speed up the Internet browsing experience over satellite Wi-Fi, content was locally cached so that it would load quickly and offer users a uniquely fast browsing experience.

When the service was operational, users enjoyed the high speeds of the cached content, particularly those that used video.

Product design – lessons learned

The equipment needs to be designed with the local context in mind; as is the case for rural and peri-urban areas in emerging markets, the equipment must be rugged to endure heat and dust, small and compact to not draw unnecessary attention and not be power intensive (or has a built in solar solution).

Caching content is a business model innovation that can provide users with a fast browsing experience while minimising data transmission costs, but requires a content management system that regularly updates the content depending on usage.

Evaluating conditions for success

Conditions for success – Equity trial

Content and customer strategy: The consortia offered a broad set of topics for customers to browse through without properly identifying who the customer is and what their interests might be.

Monitor and evaluation: The consortia selected a set of key performance indicators to evaluate the programme's success but were designed to evaluate the initial programme's design, not to evaluate the programme when programmatic shifts were made (i.e., monitoring open Wi-Fi at certain sites).

Conditions for success – lessons learned

The overall content and customer acquisition strategy should be anchored and rooted around the technology provided; as is the case with satellite, the intended customer is likely peri-urban or rural, is cost conscious and likely has limited experience navigating and browsing the Internet.

To drive uptake, it is critical to make the Internet relevant to the user; as is the case for peri-urban and rural customers, consider limiting the amount of content available to help with the browsing experience, carefully curating what the user can access and iterate on the offering through usage and data analytics.

Conclusion
— Key considerations for the space sector

Evaluating commercial opportunity

Commercial opportunity – Equity trial

The viability of the programme depended on whether or not the service helped agents generate enough revenue for Equity to justify the CAPEX and OPEX.

Across the pilot sites, less than 5% generated enough increased revenue to justify the business case for deployment.

To sustain this programme, it is recommended that satellite technology be introduced as one mode of connectivity offered in areas where coverage was poor or non-existent and subsidised through the profits generated off lower cost connectivity options.

Commercial opportunity – lessons learned

Unlocking demand for Internet access in areas where satellite has a competitive advantage (rural, peri-urban geographies) will require:

— Training and education campaigns to help onboard novice users comfortably navigate the Internet.

— Grant funds to help support the training and education campaigns.

Given this, satellite providers may need to lengthen their timetable towards profitability in justifying connectivity ventures for the unconnecting emerging market customer.

Overall assessment and key consideration

Assessment of the Equity trial

The Equity trial explored the commercial case for using satellite connectivity as backhaul for Wi-Fi access across the Equity network in Kenya.

The results of the trial suggest that though there is a strong interest for the service, the high CAPEX and OPEX of satellite connectivity in areas where there are lower cost options makes it challenging to justify.

However, the increased foot traffic and usage patterns in rural agent locations suggest there is a business case for offering connectivity.

Key consideration: Additionality vs. commerciality

The space industry will need to balance the tension between the value of satellite additionality in regions that are not connected, and making the venture immediately commercially viable.

Once demand for access is unlocked, the business case for satellite commerciality will emerge but may become threatened by lower cost options like GSM or fibre moving into market. To counter this, the satellite industry should continue to explore technological and business innovations.

Appendix

Digital content for customers

To reduce transmission costs while offering a fast and interactive user experience, Equity group cached digital content for financial services, entrepreneurship, health, agriculture, education and news at participating agent locations for free access to all customers.

In addition, Equity group provided open access to websites where users could freely browse at their leisure.
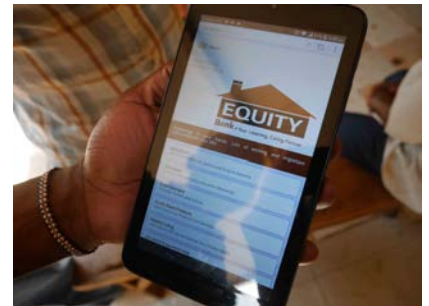
Digital content for schools

The consortium provided Wings to Fly partner schools with locally cached content and satellite backhaul.

For the first time, many of these schools had access to online learning and teaching websites.

Schools also gained access to Wings to Fly Learning, a robust, offline digital learning library designed for secondary school students in Kenya.

ERP system for agents

Through agent interviews and research, Satellite Catapult identified the need to provide digital tools for Equity agents as a B2B tool.

The service offered to help them manage data and information flow about their inventory and transactions flow as well as on their customer base.

Technology used at agent sites

BGAN - Broadband Global Area Network (BGAN) terminals were placed at each of the pilot locations to provide geostationary satellite backed Internet access across the Kenya.

BRCK - The BRCK was used as a wireless access point to translate the Internet access signal provided by the BGAN into Wi-Fi that could be accessed within a local radius.

Casing - The casing was designed to endure the rugged topography and protect a data rendering device to expedite data transmission (Xiplink), cables to connect all the devices to the battery that powered the bill of materials, the BGAN and the BRCK.

Appendix

Evaluation approach

| Month 0 | Month 3 | Month 5 | Month 9 | Month 11 | Month 12 |

Sprint 1 and deployment   Sprint 2   Sprint 3   Sprint 4   Close-out

Months 0-3 were focused on:

– Deploying the satellite equipment at the agent and school sites

– Developing training and marketing for the agents

– Sourcing content partners for the platform

– Conducting initial user research to assess interest behind service

– Compiling research and findings at Sprint 1

Months 3-4 were focused on:

– Performing site maintenance at all agent sites while addressing technical constraints to access (transmission, site-loading)

– Designing and iterate the user interface based on survey feedback and site research

– Monitoring data usage rates on the content platform

– Conducting user research around content experience among agents and users

– Compiling and sharing user research and site performance at Sprint 2

Months 5-9 were focussed on:

– Performing site maintenance at all agent sites while addressing technical constraints to access (transmission, site-loading)

– Monitoring data usage rates on the content platform

– Conducting user research to assess agent preferences for content packages and willingness to pay for the services

– Compiling and sharing user research and site performance at Spring 2

Months 9-11 were focused on:

– Performing site maintenance at all agent sites

– Monitoring data usage rates on the content platform

– Conducting user research to further assess agent preferences for content packages and willingness to pay for the service

– Compiling and sharing user research and site performance at Spring 3

Close-out was focused on:

– Reviewing approaches and data analysis around commercialising the service

– Reviewing programmatic lessons learned

Appendix

Evaluation: Data analysis

From June 2015 to March 2016, the consortia tracked quantitative data from digital sources and agent surveys for 200 Equity My Life sites.

The data stretched across the following topic areas:

— Data consumption per agent site

— Content viewed, visited and downloaded per agent site

— Agent opinion with the service, marketing, troubleshooting, business impact and content usage

The quantitative data evaluated performance against three assessment goals:

— Accessibility: How reliable is the underlying technology

— Usability: How engaging is the programme for users

— Usefulness: What commercial and socio-economic impacts does the programme create

Evaluation: User research

From March 2015 – February 2016, the consortia conducted four user research sprints to evaluate the fitness of the Equity Affordable Wi-Fi Access pilot.

Each sprint included discussions with Equity agents as well as focus groups and one-on-one meetings with customers/community members located near the pilot hotspots in urban, peri-urban and rural areas.

Over the course of the year, each research sprint provided: 1) deeper insights into the service user experience and potential business models, and 2) resulted in a number of recommendations and learnings for future application of the service.