# Concept Note
# Internet Performance Measurement

## Introduction

The access to and performance of mobile broadband connectivity has become an increasingly significant issue among developing nations, and the need for widespread broadband access, which is critical to economic growth, job creation, and social inclusion, has never been higher.

The geographic differences in broadband infrastructure and investments have led to large national and regional differences in access and performance of mobile broadband internet service. Moreover, there are supply-side challenges involved with implementing the latest mobile technologies, as well as demand-side barriers that prevent potential users from using the service even if it becomes available, and as a result fundamental inequities in people's ability to access the internet service persist.

A digital infrastructure that is universally accessible and offers adequate internet speed at an Affordable price is necessary to reap the full economic and social benefits of modern data services (The World Bank). Nonetheless, the developing world lags behind, with significant inequalities evident between high income and low-income countries regarding broadband connectivity, which highlights the need to address all three aspects of broadband access holistically: availability, affordability, and capacity to use it in order to close the digital gap (Broadband Commission, 2020)

## Research Objectives

- Measure the performance of mobile broadband internet and identify service bottlenecks from demand side perspective.
- Compare the deprivation levels of the mobile broadband internet speed across the selected countries and within rural and urban areas.
- Understand the implications of the short- and long-term spatial and temporal dynamics of mobile broadband internet speed on people's wellbeing.
- Highlight the inequalities and disparities in terms of mobile broadband internet performance.

# Proposed Methodology

The study will be conducted in eight countries alongside RIA's After Access Survey 2022 and will be part of a wider effort to understand both the changing barriers to adopting dynamic technologies and the emerging after-access challenges that Africa faces. It will collect comparable mobile broadband internet speed test data for different regions within each selected country. Providing location-based speed tests is an integral part of the research approach to measure existing geographical disparities in access and performance of mobile broadband internet across the countries. Many international measures and indices do not provide indicators for many African countries and the data provided usually reflect broadband quality in capitals or major cities. The data will also inform broadband access speeds and equity indicators of socio-spatial structure that draw on RIA's After Access indicators and RAMP pricing portal data. Together with the examination of the geography of internet exchange points and their effects on the service performance, more can be learnt about mobile broadband internet speed. This study will help to develop a comprehensive picture in the selected African countries – Burkina Faso, Ethiopia, Kenya, Nigeria, Senegal, South Africa, Tanzania, and Uganda – that can be used to inform evidence-based policymaking and competition and consumer-centred broadband regulation.

## Data collection through speed tests

Data will be collected through a Web-based application (SpeedTest) that is offered by Ookla , which is basically a user-friendly performance and internet speed test application that will enable the measurement agents to test their Internet connection speed on their mobile phones in each selected enumeration area (EA). Data collectors will use the testing application that when run provides a small file (of known size) that is automatically downloaded and uploaded, thus enabling speeds to be estimated (i.e. size/time). After running a speed test, data collectors are requested to supply all the information provided with a geolocation point and to confirm details of the connecting Internet company/package along with other information. Providing location-based speed tests is an integral part of the research approach that will allow the measurement of existing geographical disparities in access and performance of mobile broadband internet across the selected countries, and furthermore, deliver Broadband access speeds and equity indicators of socio-spatial structure that draw on Research ICT Africa After Access indicators and RAMP pricing portal data. Finally, the socio-spatial analysis of mobile broadband internet speed can be further investigated by exploring the geography of internet exchange points and their effects on the service performance.

## Metrics and measurement method

1. Research ICT Africa will be the controller and the collector.
2. The measurement agents are the fieldwork data collectors.
3. The measurement peer is the software used.
4. Test Parameters and data to be collected and measured:
   a. Connection type
   b. Operator name (can be assigned to each data collector ID and pre-populated in the data set automatically)

c.  Prepaid package name and service type ( 3G or 4G)
d.  GPS coordinates
e.  Country, state, district etc. (can be pre-populated and included in the data set )
f.  Download Speed
g.  Upload Speed
h.  Latency
i.  Server (Test Server)
j.  Date and time stamp (Can be also programmed and pre-populated in the data set)
k.  Device and Manufacturer information (can be also pre-populated) –(Devices (phones, tablets, PCs, etc…) can have very different Wi-Fi and cellular radio capabilities and it would be beneficial for us if we could capture those for later analysis).
l.  User IP address
m.  TCP and UDP settings
n.  Operation system version
o.  Attachment: eg.CSV file from Ookla speed test (this can be used to cross-check the data and for quality assurance if needed and it allows us to eliminate any human error).

**Proposed data collection approach**

Generally, the sampling and data collection method as well as any technical consideration for fieldwork will be done simultaneously and in line with the After Access survey 2022. However, some technical and operational aspects will be implemented as part of the proposed approach for internet performance measurement data collection :

-   Each team of measurement agents who will cover a specific area should have sim cards for all national network operators in the selected country (which means the measurement agent  might have to use two sim cards or three depending on the number of ISP per country)
-   EAs Teams will  subscribe to data packages that provide 3G and 4G service, within each EA and network provider.
-   Speed tests are run per enumerator area (EA), network provider and finally the type of prepaid service (3G or 4G) in the specified country.
-   The measurement agent will download the Speed Tester app on their IOS or Android devices used for the data collection.
-   Measurement agents will then record the metrics data using a data collection software.

## Quality assurance

a)  GPS coordinates can be cross-checked against the GPS coordinates of the National statistical offices EAs lists and verified by defining a maximum geofence point between the two coordinates.
b)  An attachment CSV file can be used if data discrepancies are introduced.
c)  Running several speed tests per network provider in the EA at different times (which will also help us on measuring the consistency score) .
d)  Pretests of the measurement peer and the quality of metrics data collected.

e) Research ICT Africa will establish the conditions required to ensure a reliable measurement and minimum possible measurement errors during the data collection due to the unfulfillment of conditions including but not limited to background applications, OS and applications configuration, peak hours, etc.

f) Security considerations: currently the proposed measurement approach doesn't impose any security concerns on the measurement agents or any other entity.

## 5.  References

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