Challenges facing operators in developing counties in their efforts to migrate from 2g to 3G and beyond.

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INFRASTRUCTURE COSTS

- 3G networks need new infrastructure to operate at high costs. Developing countries can barely afford this:
  - Soft switching platforms
  - Software and license fees
  - Optical transport networks
  - Media gateways
  - Interfacing equipment
  - Terminal equipment
  - Billing reconciliation software..

Standards

- Standards must be put in place.
  - Some equipment are proprietary
  - ITU-Standards sometimes not followed by equipment manufacturers
  - ANSI vs ETSI vs IEEE vs ITU vs ISO standards which one to adopt in developing country;
  - If the money comes from EU then you must buy from EU..
  - Equipment from multiple vendors means Interfacing and interconnection problems
  - QoS for voice and data may not guaranteed between fixed , mobile and wireless networks in a converged 3G network.

Interconnection

- Interconnection between Mobile, fixed and data network operators is not easy
  - Lack of transparency and trust
  - Confidentiality of freely flowing information means financial risks for some
  - Privacy and security of data in the networks poses some business problems
  - Hackers may intercept vital business and personal information

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Regulatory matters

- Entry of 3G operators not easy:
  - High license radio frequency fees
  - Resistance to change by regulators. They want to maintain the status quo
  - Existing operators create cartels to prevent new entrants into the market
  - Who will be in charge of the interconnect between fixed and mobile,
  - is it a level playing ground
  - How will the revenue be shared between operators

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Radio spectrum

- Lack of spectrum for 3G radios in some countries
- Possibilities of interference with existing 2G and 1G radios in use
- Spectrum re-farming is not easy in some countries because the frequencies are being used by security and intelligent services
- Spectrum management systems are lacking in some developing countries

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Radio infrastructure

- The wireless network must have high quality
- The link must have high availability 99.9999%
- Must cover the entire service area
- High capacity, high bandwidths
- High link throughput, high traffic
- High spectral efficiency
- Mobility
- Free of interferences/ high carrier to interference ratio (C/I)
- Low bit error ratio (BER) or high signal to noise ratio (S/N)

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Human resources

- Human capital is very vital for implementation of 3G and NGN
  - Lack of skilled engineers and technicians in developing countries
  - Brain drain ; best engineers from Africa migrate to America and Europe through green card system.
  - Critical need for training in telecommunication, IT and software in developing countries

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Planning tools for 3G

- Some radio Planning tools are available
- -from ITU- PLANITU
- STEM from Analysis
- Pathloss 4
- Some open source software.

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Feasibility study

3.1 Feasibility study:-

The feasibility study is necessary before a network plan is prepared. The purpose of the feasibility study is to determine the economic viability and sustainability of the project. The study focuses mainly on the following:

- Population and population density
- Existing service if any
- Available infrastructure e.g.. electric power, roads, buildings, towers
- Physical features including hills, valleys, forests
- Demand for services
- Competitors and their market shares
- Collection of traffic data

Traffic analysis

- The traffic collected from the proposed service area together with the demographic figures must be analyzed in order to determine economic viability before any investment can be undertaken. Some of the parameters used in traffic analysis are listed below:
- Demand
- Traffic offered
- Traffic carried
- Calling rate and call probability
- Call completion rate
- Busy hour call attempts
- Blocking probability
- Grade of service expected
- The Erlang formula is useful in the calculation of traffic. After carrying out traffic calculations we will know the capacity of the system a, the number of circuits required, calling patterns, QOS and many other factors required for the dimensioning of our system.

Technology study

- The technology study shall involve the comparison of several competing technologies for our proposed system for example TDMA, CDMA 2000, TDD, CDMA 1X EVDO, UMTS, WCDMA, EDGE, TDD etc.
- The systems will be compared with the requirements for our system in terms of capacity, services, QOS, Reliability, standards. Some of the parameters used for evaluation of technology are:
    - User data rates offered
    - Type of terminals
    - Access subsystem
    - Transport subsystem
    - Service subsystem
    - Mobility subsystem
    - Security subsystem
    - Power consumption
    - Immunity to EM Interference
    - Availability of spare parts
    - Interface with existing and planned systems
    - Conformity to ITU-T and ITU-R standards

Economic analysis

Economic analysis is necessary before investment in any project.

- It is necessary in order to establish whether the investment cost will result in revenue and profit.
- It will also show whether the business is economically viable and whether the market is big enough. Some of the factors to be considered are listed below:

Marketing.

- determine subscriber base at present and projections for the proposed service area
- determine market trends in terms of tariffs and airtime charges
- customer penetration analysis
- Growth in revenues estimation
- Costs of transition to new technology
- Costs of marketing, advertising, acquisition, retention, licensing, operation, real estate, content and application development
- equipment costs (Capex)
- Interconnection costs
- Estimation of Opex costs
- Development of a revenue structure
- Computation of net present value (NPV)

Sensitivity analysis

- Sensitivity analysis is carried out in order to prove whether the proposed investments will yield any profits in the short, medium and long terms.
- inputs
  - Traffic demand
  - Service penetration
  - Tariff erosion
  - Service offering
  - Gross Domestic product of the country (GDP)
  - Capex and Opex
  - Transition costs
- Outputs
  - Internal rate of return -IRR
  - Net Present Value –NPV
  - Average Return on investment per user (ARPU)
  - Revenue projections
  - Cash flow
  - Business plan

Successful 3G wireless network

- **Success criteria**
  - Detailed study
  - Detailed traffic analysis
  - Detailed network design
  - be prepared to invest in CAPEX, OPEX and HR
  - Ensure availability of frequency spectrum
  - Chose the right technology
  - Consider future O&M issues
  - Adhere to standards
  - Work with the regulator and ITU

Conclusion and way forward

- It is very important that the ITU considers the five main challenges facing developing countries:
- Cost effective systems
- Standards must be followed
- Interconnection conflicts
- Regulatory deficiencies
- Lacking skills
- Pilot projects in some developing countries