Are Public E-Services in Africa Necessities or Luxuries?
Is Investment in such Services Economically Viable and Equitable?

Researcher: Dr Kifle Asfaw Wondemu
Supervisor: Dr Rana Tassabehji
EIB Supervisor: Anders Bohlin
2nd February, 2012.
Presentation Overview

- A short introduction to Bradford
- Objectives of the STAREBEI research
- Introduction to Public e-services
- Status of E-services in Africa
- Current research/literature (pre-STAREBEI study)
- Methodology & data collection
- Results and findings from the empirical study
- Summary and conclusions
- Recommendations - suggested action points
University of Bradford
School of Management

The School
- 1st in the North of England
- 11th in the UK
- 37th in the Europe

Financial Times European Business school rankings 2011
(5/12/2011)

The Bradford MBA
- 14th in the UK
- 25th in Europe
- 90th in the world

Financial Times (full-time programme) (31/1/2011)

Financial Times (part-time programme) (24/10/2011)
- 1st in the North of England
- 10th in the UK
- 31st in Europe
- 95th in the world

The Bradford MSc
- 1st in the North
- 8th in the UK

Financial Times (19/9/2011)

Research degrees
- 6th in Britain for total number of doctoral graduates for past three years
- 16th most-popular destination in world for doctoral students in business and management

Financial Times (19/9/2011)
Objectives of STAREBEI Research

- To identify and categorise existing public e-services in Africa
- Identify the demand for public e-services in Africa
- Estimate the benefits of investment in e-services
- Review existing policies relevant to e-services

More specifically:
- What is the current status of public e-services supplied by the selected countries?
- Does the supply of public e-services meet the demand by its stakeholders?
- What are the cost-benefits?
- What policies are appropriate for developing and promoting public e-services in Africa?
Public E-Services: A definition

• Public services delivered to citizens (business and civil society) using ICT infrastructures including the Internet and mobile.

• E-government is related to public e-services. E-government is:

“A broad-based transformational initiative enabled by leveraging the capabilities of information and communication technology (ICT); (1) to develop and deliver high quality, seamless, and integrated public services; (2) to enable effective constituent relationship management; and (3) to support the economic and social development goals of citizens, businesses, and civil society”. (Grant and Chau, 2005:9).
Public E-services in Africa: Development Context

- Resource scarcity calls for efficient resource allocation
- Markets are an efficient mechanism
- Market failure calls for government interventions
- Intervention imposes cost (red tape and corruption)
- However, interventions also impose cost
- E-government is a win-win solution to reduce cost
- African countries have invested 3.6% of GDP on ICT (2010)
- Investment decisions in e-government based on world experience and subjective judgement
Public E-Services:

*Examples*

- **Online application/renewals**
  - driving licences; birth/marriage/death certificates; passport renewal/application

- **Online payment**
  - utilities; tax; fees and charges for public services

- **Civic Engagement/Responsibility**
  - reporting problems e.g. graffiti, potholes
  - Democratic process (online voting; e-consultation; e-petitioning)
The Status of Public E-Services

The Evaluation Framework

The Status of Public E-services In Africa

From the total in %

The Development Stages of Public Websites Visited

- Stage 0
- Stage I
- Stage II
- Stage III
- Stage IV
Public E-services in Africa: 
*Review of Current Research (pre-study)*

- Very few studies
- Mostly focused on technical issues (functionality and usability)
- Used frameworks suitable for developed countries which don’t capture African realities
- Failed to elucidate the link between e-services and poverty reduction
- Did not assess the economic viability of e-services
Gaps Addressed by Our Study

• Do public e-services in Africa underpin poverty reduction objectives?
• Is investment in public e-services economically viable?
• Are these services necessities or luxuries?
• Who gains and what is its economy wide impact?
Public E-services and the Poor

Slope of $BB' > AA'$
Does it mean Public E-services are not relevant in Africa?

• For individuals with more capital, accessing traditional public services is allocatively inefficient and this makes the economy to operate inside its PPF.

• It deprives economic agents from fully benefiting from the technical change and makes the economy to operate at lower PPF than the potential one.

• Public e-services improve economy wide economic efficiency-reduces deadweight loss and enhance growth

• Given that fewer people are able to use public e-services, is investment economically viable?
The Cost of Delaying Public E-Services

\[
\text{Struct. Inefficiency} = \frac{OL}{LB'} - \frac{ON}{NA'}
\]
Economy Wide Impact of Delaying E-services
Research Challenges and Approach

• Data constraints in Undertaking Cost-benefit Analysis:
  – The monetary value of the benefits generated by e-services is not readily available.

• Approach:
  – We use a Contingent Valuation Survey to indirectly measure the benefit.
  – Based on the concept of the compensating valuation, we postulate a notional demand curve and measure the benefit as an area below the curve.
Theoretical Framework

\[ k = \alpha + \phi w(t + q) + \delta D \quad \text{where } 0 < \phi < 1 \]

Our objective is to get a monetary equivalent of the welfare change:

\[ \frac{\Delta U}{\lambda} = U_1(k_1, P, W, Y, S, T) - U_0(k_0, P, W, Y, S, T) \quad \text{where } \lambda = \text{marginal utility of income} \]

\[ V_1(k_1, P, W, Y - \text{WTP}, S, T) = V_0(k_0, P, W, Y, S, T) \]
Deriving the Notional Demand Curve for E-services

- \( \Pi = U(Z, X, l, S) + \lambda(Y - PX - kZ) + \mu(T - N - l - Q - R) \)

On the basis of the first order conditions, the change in utility due to the shift from traditional to online channel, may be expressed using a Taylor series expansion:

- \( V(k1, P, W, Y, H, T) = V(k0, P, W, Y, H, T) + \frac{\partial V(k0, P, W, Y, H, T)}{\partial k} dk \)

- \( \Delta V = \frac{\partial V(k0, P, W, Y, H, T)}{\partial k} dk = -\lambda Z^*(P, k, Y, W, T, H) dk \)

- \( \Delta V = \int_{k1}^{k0} -\lambda Z^*(P, k, Y, W, N, H) dk \)

- \( WTP = -\int_{k1}^{k0} Z^*(P, k, Y, W, N, H) dk \quad \text{Where} \frac{\Delta V}{\lambda} = WTP \)

- \( WTP = -\int_{k1}^{k0} Z^*(P, k, Y, W, N, H) dk + \varepsilon \)

In order to get an aggregate value of the welfare measure we need:

(i) an empirical notional demand curve \( Z^*(P, k, Y, W, N, H) \)

(ii) the cost of service access using the traditional (K0) & electronic (K1) channels.
Econometric Model-to estimate Notional Demand Curve

\[ P(\text{yes}) = \Pr (WTP - b > \varepsilon_i) \quad \text{and} \quad P(\text{no}) = \Pr (WTP - b < \varepsilon_i) \]

\[ I^{yy} = 1 - \Phi(B^2, \beta), \quad I^{nn} = \Phi(B^1, \beta), \quad I^{yn} = \Phi(B^2, \beta) - \Phi(B^1, \beta) \quad \text{and} \quad I^{ny} = \Phi(B^1, \beta) - \Phi(B^2, \beta) \]

\[
\ln \ell = \sum_{n=1}^{N} \left\{ I^{yy} \ln \left[ \left( 1 - \phi \left( \frac{B^2 - \beta'X}{\sigma_2} \right) \right) \right] + I^{yn} \ln \left[ \Phi \left( \frac{B^2 - \beta'X}{\sigma_1} \right) - \Phi \left( \frac{B^1 - \beta'X}{\sigma_2} \right) \right] + \\
I^{ny} \ln \left[ \Phi \left( \frac{B^1 - \beta'X}{\sigma_1} \right) - \Phi \left( \frac{B^2 - \beta'X}{\sigma_2} \right) \right] + I^{nn} \ln \left[ \phi \left( \frac{B^2 - \beta'X}{\sigma_2} \right) \right] \right\}
\]

Where \( I^{yy} \) is an indicator function that equals 1 when both responses of the individual are “yes” and zero otherwise. \( \phi \) and \( \Phi \) respectively represent the normal probability density and cumulative functions.
Data Collection

• Data Collection:
  – Local enumerators (Addis Ababa, Johannesburg and Lagos).
  – Stratified random sampling
  – Economically active citizens with ICT skills
Sample Size and Characteristics

<table>
<thead>
<tr>
<th>Variables</th>
<th>Ethiopia</th>
<th>Nigeria</th>
<th>South Africa</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size (Number)</td>
<td>482</td>
<td>411</td>
<td>404</td>
<td>1297</td>
</tr>
<tr>
<td>Private sector Employees</td>
<td>50%</td>
<td>64%</td>
<td>66%</td>
<td>59%</td>
</tr>
<tr>
<td>Owners of Private Business</td>
<td>20%</td>
<td>29%</td>
<td>23%</td>
<td>24%</td>
</tr>
<tr>
<td>Males</td>
<td>74%</td>
<td>68%</td>
<td>63%</td>
<td>69%</td>
</tr>
<tr>
<td>Average Age</td>
<td>38</td>
<td>35</td>
<td>32</td>
<td>35</td>
</tr>
<tr>
<td>Degree Holders</td>
<td>79%</td>
<td>70%</td>
<td>43%</td>
<td>65%</td>
</tr>
<tr>
<td>Average Monthly Income</td>
<td>£298</td>
<td>£765</td>
<td>£1,695</td>
<td></td>
</tr>
</tbody>
</table>
Estimating the cost of access
(Double-Bounded Dichotomous choice Contingent Valuation Questions)
Table 2: Demand for E-services

<table>
<thead>
<tr>
<th></th>
<th>ETHIOPIA</th>
<th>NIGERIA</th>
<th>SOUTHAFRICA</th>
</tr>
</thead>
<tbody>
<tr>
<td>INCOME</td>
<td>0.14***</td>
<td>37.57***</td>
<td>2.03***</td>
</tr>
<tr>
<td>TIMEspent</td>
<td>0.41*</td>
<td>23.28*</td>
<td>6.13***</td>
</tr>
<tr>
<td>GENDER</td>
<td>-7.23</td>
<td>-277.63</td>
<td>25.99***</td>
</tr>
<tr>
<td>OWNBUSIN</td>
<td>36.80***</td>
<td>724.56***</td>
<td>17.40#</td>
</tr>
<tr>
<td>AGE</td>
<td>0.79***</td>
<td>22.16***</td>
<td>1.84***</td>
</tr>
<tr>
<td>EDUCATION</td>
<td>19.48***</td>
<td>410.95*</td>
<td>14.67#</td>
</tr>
</tbody>
</table>

Sigma _cons 41.09*** 1589.27*** 61.67***

N 418 404 366
N 11 -1046.26 -1319.79 -785.90

* p<0.05, ** p<0.01, *** p<0.001
Source: Own Calculation based on the Survey Data

Table 3: Demand for M-government

<table>
<thead>
<tr>
<th></th>
<th>ETHIOPIA</th>
<th>NIGERIA</th>
<th>SOUTHAFRICA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>INCOME</td>
<td>0.14**</td>
<td>40.99</td>
<td>3.38***</td>
</tr>
<tr>
<td>GENDER</td>
<td>-3.49</td>
<td>-953.64*</td>
<td>44.48*</td>
</tr>
<tr>
<td>EDUCATION</td>
<td>20.20**</td>
<td>246.33</td>
<td>12.13</td>
</tr>
<tr>
<td>OWNBUSIN</td>
<td>52.71***</td>
<td>680.39</td>
<td>4.98</td>
</tr>
<tr>
<td>USEMOB4INTER</td>
<td>32.09***</td>
<td>820.55</td>
<td>63.99**</td>
</tr>
<tr>
<td>AGE</td>
<td>1.17***</td>
<td>48.57**</td>
<td>1.31</td>
</tr>
</tbody>
</table>

Sigma _cons 59.93*** 2468.59*** 92.44***

N 315 185 86
N 11 -722.71 -675.45 -243.19

* p<0.05, ** p<0.01, *** p<0.001
Source: Own Calculation based on the Survey Data
Kaplan-Meier Survival Curve for Demand for E-services

Survival Probability of the WTP

Price in £

ETHIOPIA
NIGERIA
SOUTH AFRICA
Summary of Empirical Results

<table>
<thead>
<tr>
<th>Metric</th>
<th>Ethiopia</th>
<th>Nigeria</th>
<th>South Africa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marginal value of one hour Saving</td>
<td>0.89</td>
<td>2.10</td>
<td>4.50</td>
</tr>
<tr>
<td>As % share of Hourly Wage Rate</td>
<td>20</td>
<td>18</td>
<td>16</td>
</tr>
<tr>
<td>Average Saving for PC Based Access</td>
<td>2.36</td>
<td>7.18</td>
<td>12.64</td>
</tr>
<tr>
<td>Average Saving for Mobile Based Access</td>
<td>3.25</td>
<td>10.44</td>
<td>16.18</td>
</tr>
<tr>
<td>The distribution of gain (PC based Access)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Sector Employees</td>
<td>2.61</td>
<td>7.98</td>
<td>13.76</td>
</tr>
<tr>
<td>Public Sector Employees</td>
<td>1.89</td>
<td>5.79</td>
<td>10.54</td>
</tr>
<tr>
<td>Managerial Post holders</td>
<td>2.68</td>
<td>7.85</td>
<td>14.67</td>
</tr>
<tr>
<td>Non-Managerial Post holders</td>
<td>1.88</td>
<td>5.10</td>
<td>11.27</td>
</tr>
<tr>
<td>Income Elasticity of WTP for online services</td>
<td>0.26</td>
<td>0.54</td>
<td>0.32</td>
</tr>
<tr>
<td>Price Elasticity of WTP for E-Services (PC based)</td>
<td>-1.03</td>
<td>-1.11</td>
<td>-1.14</td>
</tr>
<tr>
<td>Price Elasticity of WTP for E-Services (Mobile based)</td>
<td>-1.04</td>
<td>-0.95</td>
<td>-1.21</td>
</tr>
</tbody>
</table>

WTP = Willingness to Pay
## City level Aggregate Saving of Citizens from E-services

<table>
<thead>
<tr>
<th>Country</th>
<th>ICT* Penetration Rate</th>
<th>Saving in Million £ Annual per Service</th>
<th>Aggregate Annual Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethiopia</td>
<td>20%</td>
<td>0.59</td>
<td>5.9</td>
</tr>
<tr>
<td></td>
<td>40%</td>
<td>1.18</td>
<td>11.8</td>
</tr>
<tr>
<td>Nigeria</td>
<td>40%</td>
<td>15.1</td>
<td>90.6</td>
</tr>
<tr>
<td></td>
<td>60%</td>
<td>22.62</td>
<td>135.72</td>
</tr>
<tr>
<td>South Africa</td>
<td>60%</td>
<td>1.3</td>
<td>10.4</td>
</tr>
<tr>
<td></td>
<td>80%</td>
<td>16.8</td>
<td>134.4</td>
</tr>
</tbody>
</table>

NB: *The ICT penetration rate refers to the ratio of economically active individuals that have access to ICT devices, skills and services, to the total number of economically active individuals in the city.
Determinants of Supply of E-Services

Source: UN E-Government Survey (2010)
Availability, Quality and Affordability of Telecoms Services

**Telecom Service Affordability**

- Fixed line Price
- Basket as % of GNI
- PC
- Minutes of Mobile use as % GNI
- Per Capita
- Internet Tariff Per Month
- Per-capita (in US$)

Ethiopia | Nigeria | South Africa
Summary and Conclusions

• Public e-services in Africa enhance economic growth and impact long-term poverty reduction
• Delaying implementation of e-services in Africa
  – Retards growth and poverty reduction
  – Entails significant welfare loss to citizens
  – Erodes competitiveness of the continent
• Investment in e-services is economically viable and generates high and quick return
• Investment in m-government generates higher returns and evenly distributed benefits
Summary and Conclusions

• Public-Private Partnership
  – Allows government to tackle its resource and capacity constraints
  – is a lucrative business opportunity for private service providers (pent-up demand, economies of scale, low level of initial investment requirement, quick return)

• Technical assistance and loans to private service providers will significantly impact growth in Africa
Recommendations (i)

- Implement public e-services immediately
- Introduce Public-Private Partnership for delivery of public e-services
- Telecommunications sector
  - Promote competition
  - Enhance regulatory effectiveness
- Rationalise taxation on ICT devices and telecoms services
- Address consistency of power supply
Recommendations (ii)

EIB and other bodies could play an important roles on growth through:

- Promoting development of public e-services
- Promoting Public-Private partnership in public service delivery
- Advocating Telecom market competition and regulatory effectiveness
- Providing Technical assistance and loans to private sector Service providers
- Financing interventions that enhance the ICT Skill of the poor
- Promoting R&D in developing pro-poor ICT techniques
Thank you for listening

Any Questions?