Carnegie Mellon University
Rwanda

Impact of ICT on SMEs in Africa

University of Cape Town
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Agenda

◆ CMU-Rwanda: brief overview

◆ Impact of ICT on SMEs in Africa

    ◆ SMEs contribution to employment in Africa

    ◆ Challenges facing SMEs in using IT

    ◆ Addressing the challenges with new technologies

    ◆ Remaining challenges

Carnegie Mellon University
Pittsburgh, Pennsylvania, USA

Private Research University
- Faculty: 1,423
- Undergraduates: 6,178
- Master's students: 3,937
- Ph.D. students: 1,840
- Alumni: 90,000+

U.S. News & World Report 2014 Rankings
#1 Computer Science
#1 Information System Management
#1 Multimedia/Visual Communications
#3 Computer Engineering
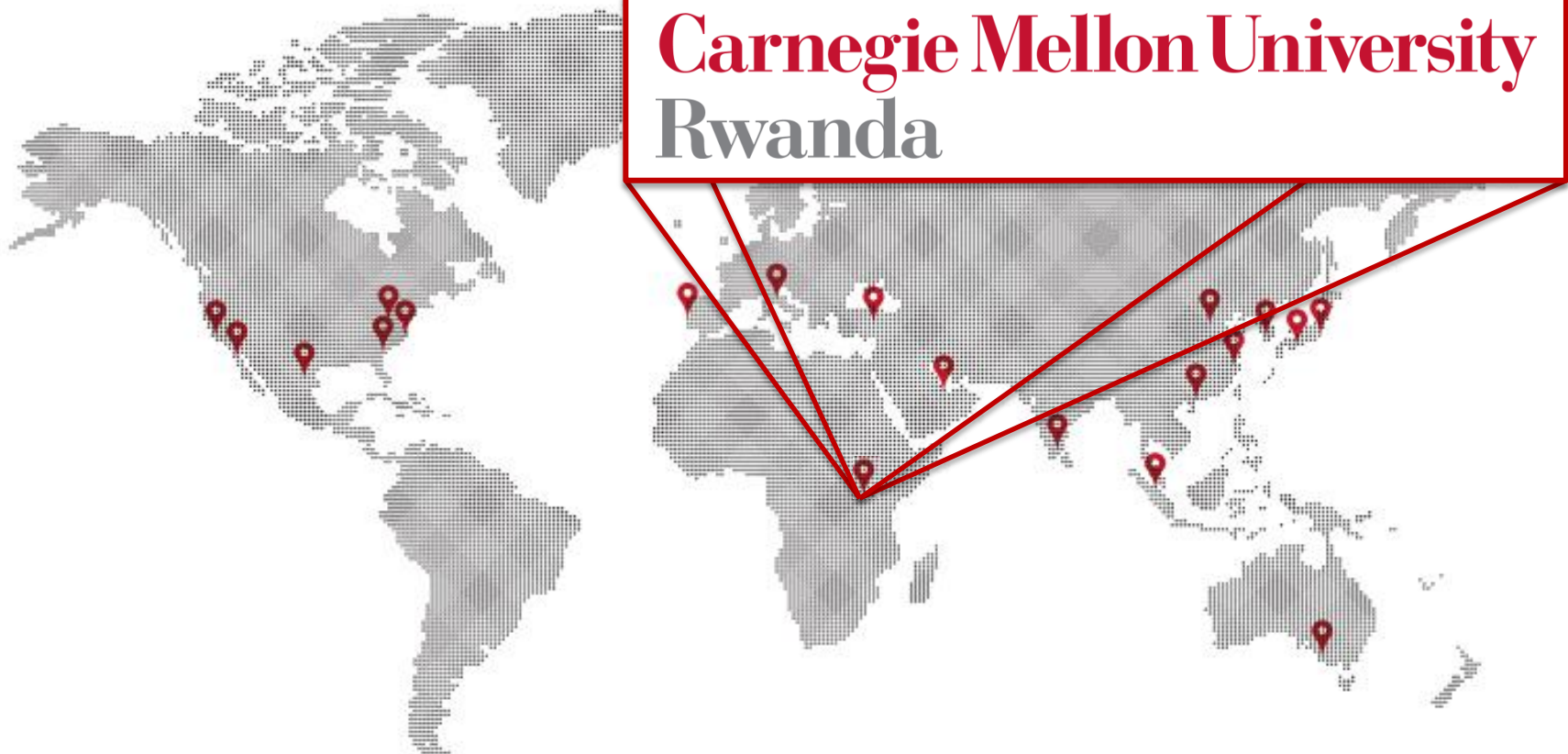#5 Engineering College

Home to 19 Nobel Laureates!

Carnegie Mellon's Global Presence

Carnegie Mellon's Global Presence

CMU-R Master's Programs

- **M.S. in Information Technology (MS IT)**
  - ◆ Began August 2012
  - ◆ Required units: 144
    - Software Engineering
    - Cyber Security
    - Networking
    - Data Science
    - IT Entrepreneurship

- **M.S. in Electrical and Computer Engineering (MS ECE)**
  - ◆ Began August 2014
  - ◆ Required units: 96

CMU-R Students

- **44 MSIT, 6 MS ECE**

- **7 women**

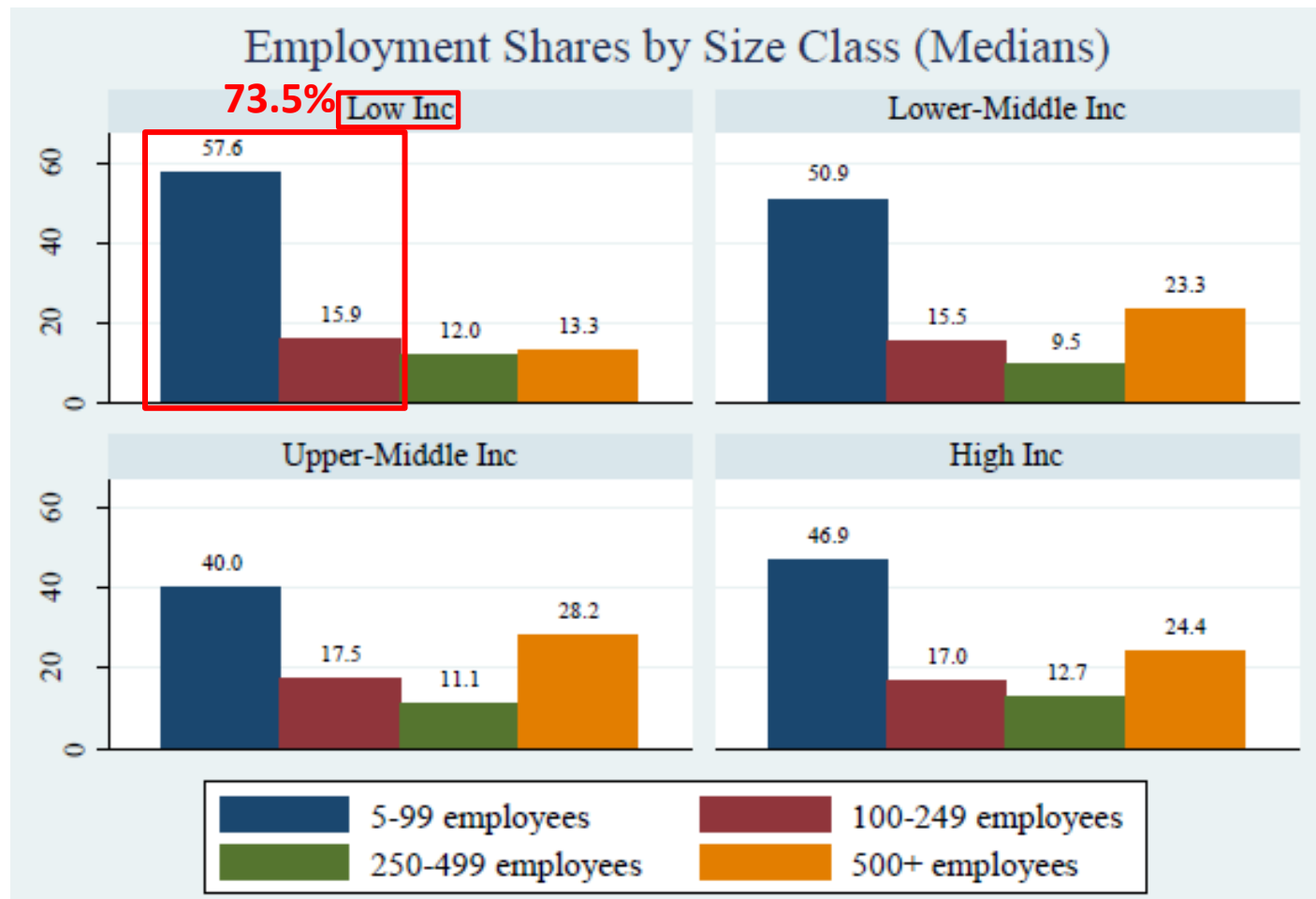- **4 Ugandan, 5 Kenyan, 39 Rwandan, 2 USA**

Leveraging ICT for SME automation in Africa

◆ **The Situation**

  ◆ SMEs contribute and generate most jobs in developing countries

SMEs contribute most to employment in developing economies (low income countries)

Employment Shares by Size Class (Medians)

Source: Small vs. Young Firms across the World, Word Bank Development Group, 2011
sample consists of 47,745 firms in 99 countries, surveyed in the period 2006-2010

Leveraging ICT for SME automation in Africa

◆ **The Situation**

    ◆ SMEs contribute and generate most jobs in developing countries

◆ **The Problem**

    ◆ The majority of SMEs' don't use ICT for the management of their business

        ■ Most business processes are still manual

        ■ Business data is stored on paper

SMEs did not benefit from ICT in most of Africa

◆ **IT was not affordable for SMEs and not easily available in sub-Saharan Africa**

   ◆ Cost was prohibitive due to the upfront costs of buying hardware and software, and managing it on-premise

◆ **Lack of IT skilled manpower**

   ◆ This prevented the development of supporting ecosystems of service providers for SMEs, similar to those available in the industrialized world

   ◆ Any available IT skills would be immediately monopolized by large enterprises

◆ **Internet was generally not available**

   ◆ When it was, the cost was high, speed was slow, and access was unreliable

Leveraging ICT for SME automation in Africa

◆ **The Situation**

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◆ **The Problem**

- ◆ The majority of SMEs' don't use ICT for the management of their business
  - ■ Most business processes are still manual
  - ■ Business data is stored on paper

◆ **The Solution**

- ◆ New technologies emerging in the last 5 years are providing SME's with affordable and more accessible solutions to automate their business processes, collect data for better business management and increased productivity

New Technologies Making an Impact in Africa

Mobile Technology

New Mobile Internet Devices
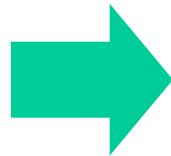## More affordable and appropriate

Laptop

Cost: $500+
Size: 25 x 38 x 3.5 cm
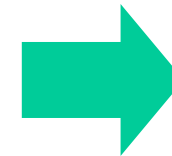**Weight: 2,500 grams**
Battery life: 4 hours

New Mobile Internet Devices
More affordable and appropriate

Mobile Internet Devices

Laptop

Tablet

Smart Phone

Cost: $500+
Size: 25 x 38 x 3.5 cm
Weight: 2,500 grams
Battery life: 4 hours

Cost: $200
Size: 24 x 17.5 x 0.9 cm
Weight: 590 grams
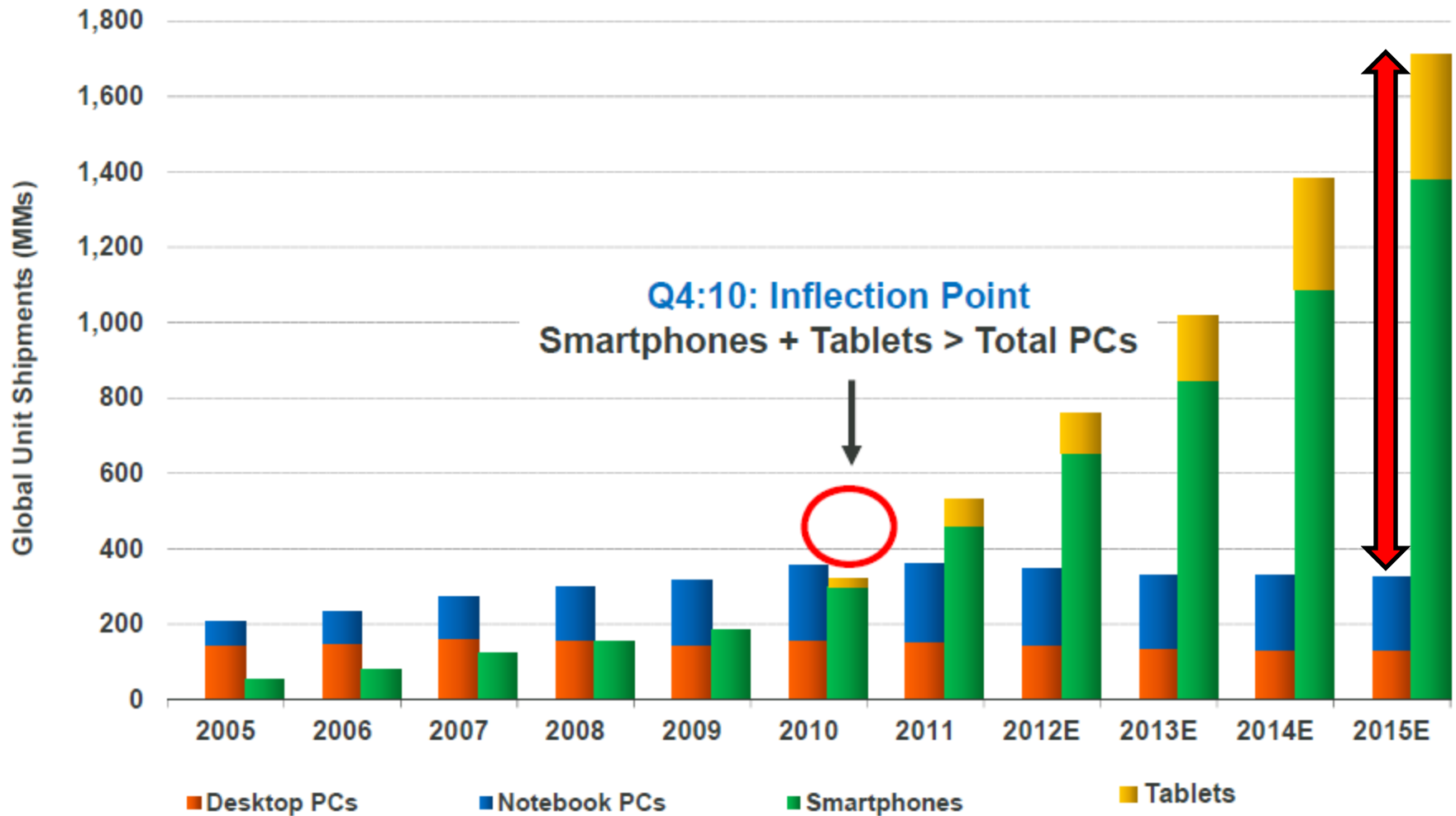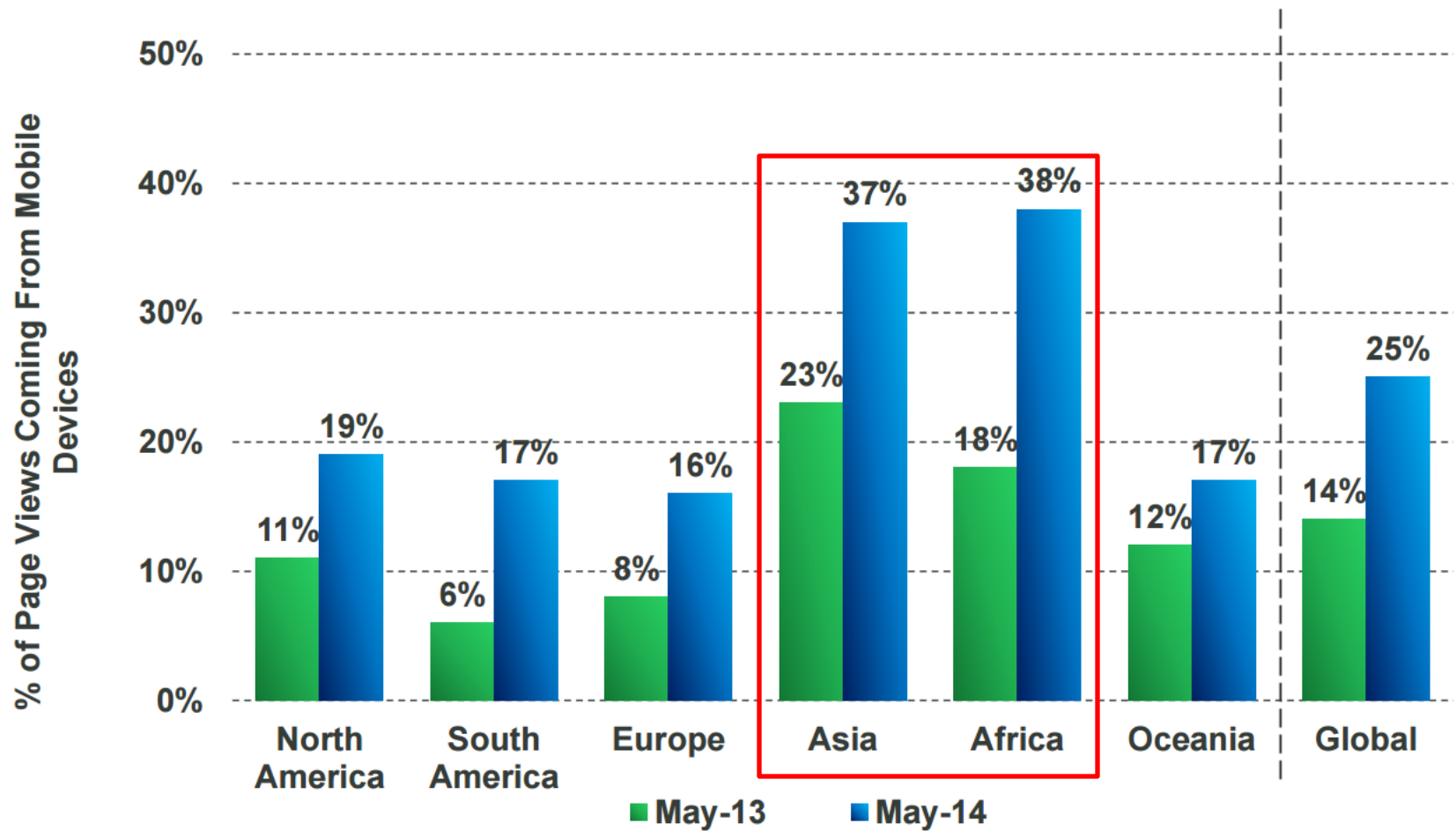**Battery life: 8 hours**

Cost: $130
Size: 10 x 5.7 x 0.9 cm
weight: 97 grams
Battery life: 8 hours

Global Smartphone + Tablet *Shipments* Exceeded PCs in Q4:10

Global Unit Shipments of Desktop PCs + Notebook PCs vs. Smartphones + Tablets, 2005-2015E

Q4:10: Inflection Point
Smartphones + Tablets > Total PCs

Legend: Desktop PCs, Notebook PCs, Smartphones, Tablets

Note: Notebook PCs include Netbooks. Source: Katy Huberty, Ehud Gelblum, Morgan Stanley Research.
Data and Estimates as of 9/12.

KPCB

25

Mobile Usage as % of Web Usage, by Region, 5/14

Source: Internet Trends 2014 – Mary Meeker/PKCB

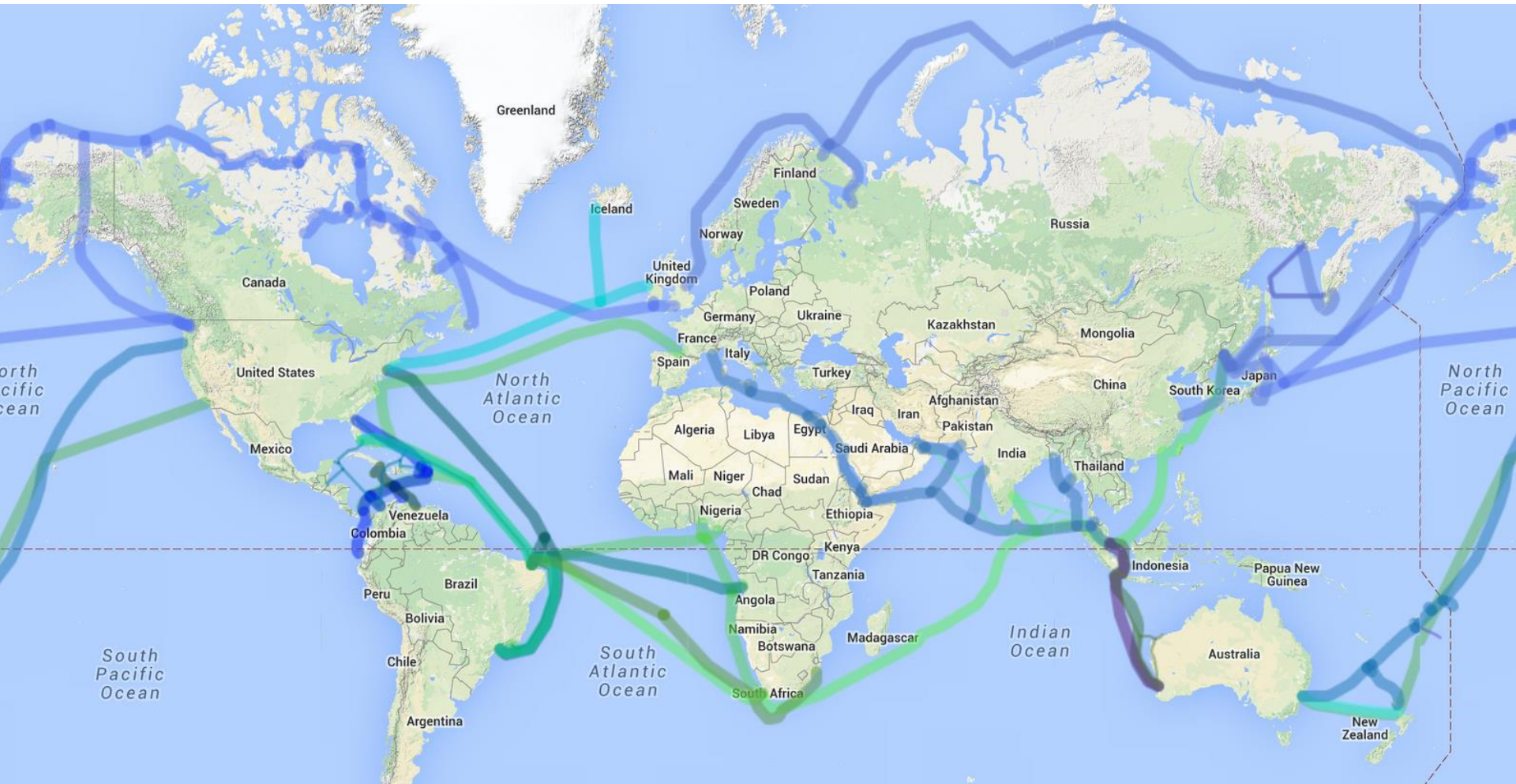# New Technologies Making an Impact in Africa

Mobile Technology

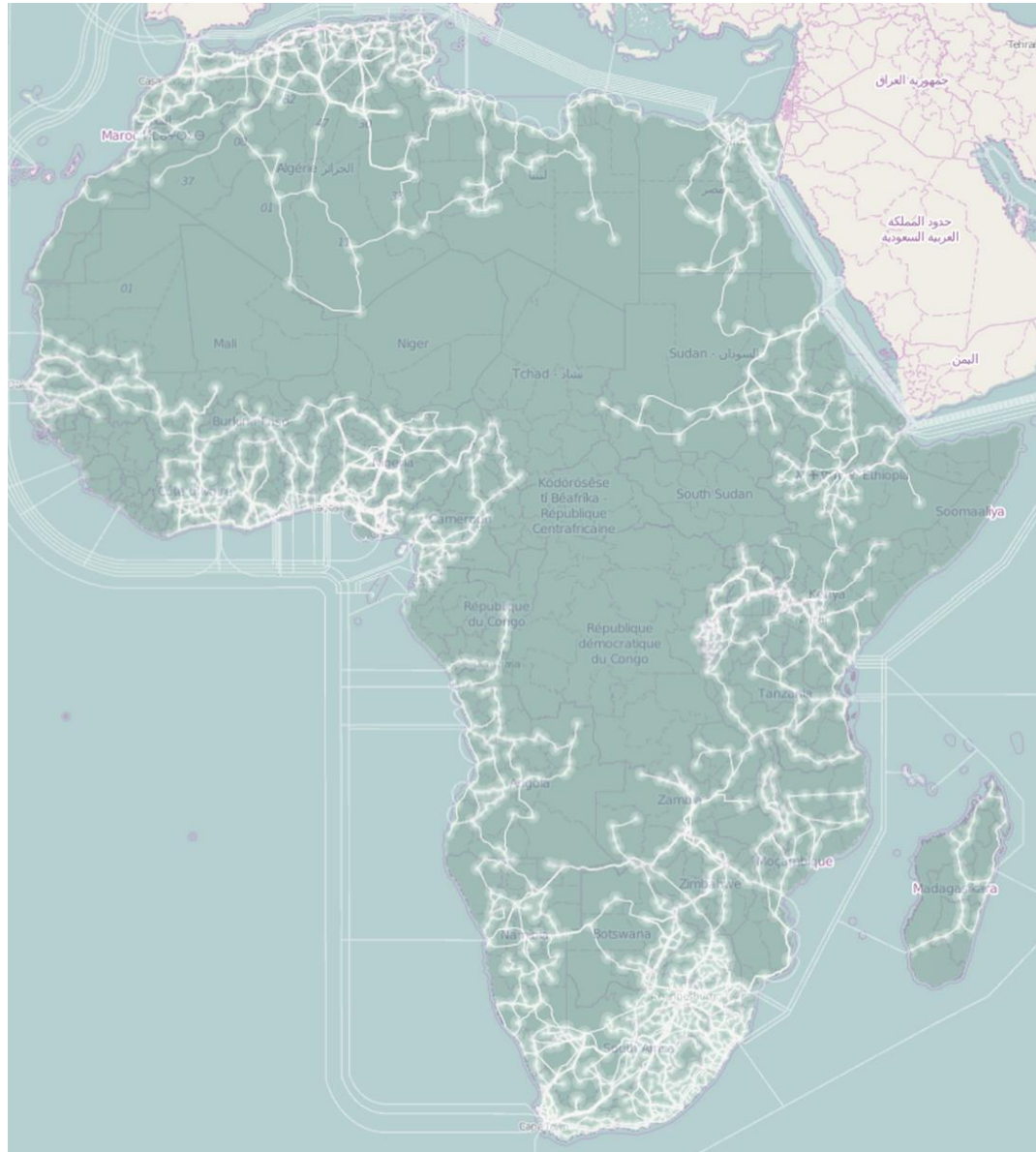# Broadband Internet

Broadband Internet in Africa

Undersea Communications Infrastructure

http://www.cablemap.info/

Future cables

Africa Fiber Reach

Source: http://www.africabandwidthmaps.com

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New Technologies Making an Impact in Africa

Mobile Technology

Broadband Internet

Cloud Computing

Cloud Computing

◆ Definition

    ◆ Cloud computing is the use of remote servers hosted on the Internet (located in the "cloud") to store, manage, and process data, rather than a local server or a personal computer.
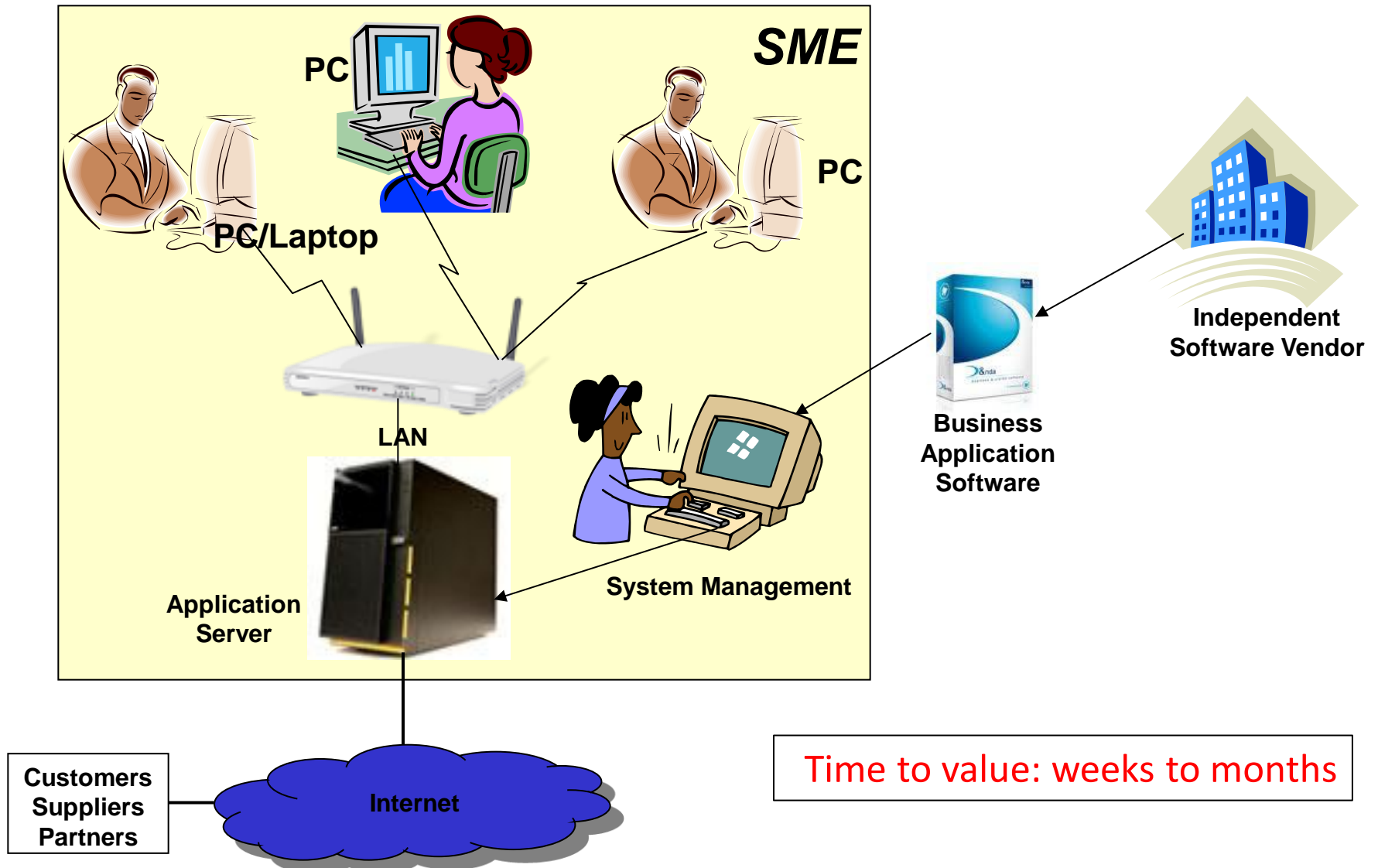
◆ New IT paradigm

    ☐ You don't have to worry about buying anything

    ☐ You pay for what you use

    ☐ You aren't on the hook to operate it

Traditional Model for SME Automation
Access to Information and Applications

SME

PC

PC/Laptop

PC

Independent Software Vendor

Business Application Software

LAN

System Management

Application Server

Customers Suppliers Partners

Internet

Time to value: weeks to months

A New Technical Model for Access to IT Resources

Mobile Internet Devices

Tablet

Smartphone

Broadband Internet

Infrastructure as a Service

Software as a Service
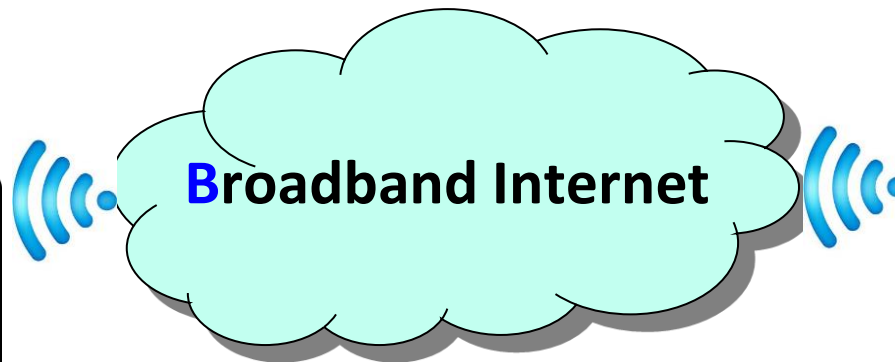
Cloud Computing Services

Cloud Computing

New Model for SME Automation

Software as a Service (SaaS)

Mobile Worker

SME

Tablet

Broadband Internet

Customers Suppliers Partners

SaaS Catalog

Independent Software Vendor

Software as a Service

Cloud Computing Services

Time to value: minutes to hours
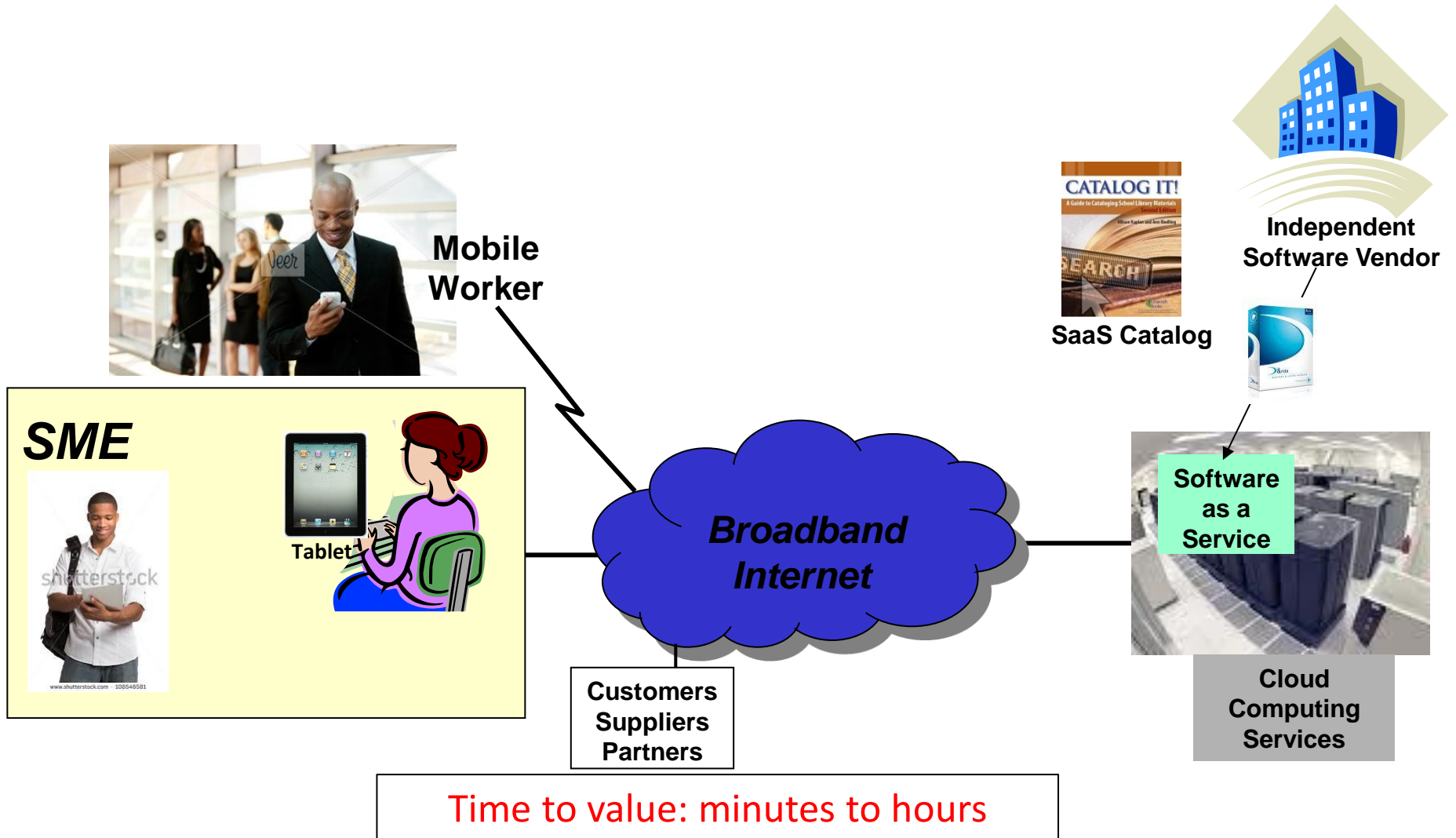
Impact of The New ICT Model for SMEs

SME with 3 employees

◆ **Traditional IT**

- Bus appl sw ($1K - $10K)
- Application server ($5K – $10K)
- 3 Laptops ($1.5)
- System management $25K

Total cost: $12.5K - $30.5K (capital) + $25K/year

Time to value: weeks to months

◆ **Cloud Service**

- SaaS: $10/month/user
- 2 Netbooks: $400
- 1 Smartphone: $130
- System management included

Total cost: $530 (capital) + $360/year (operational)

Time to value: minutes to hours

Impact of The New ICT Model for SMEs

SME with 3 employees

◆ **Traditional IT**

  ▪ Bus appl sw ($1K - $10K)

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In Africa

The absence of legacy IT makes it easier for SMEs to leapfrog into the
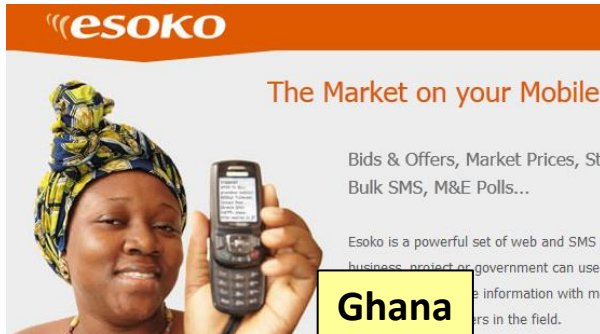
new cloud service paradigm

• No need for complex integration with existing IT

</div>

- 2 Netbooks: $400

- 1 Smartphone: $130

- System management included

◆ Total cost: $530 + $30/month

Time to value: minutes to hours

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African Software as a Service (SaaS)

Ghana

eSale
Rwanda

Ghana

Tanzania

USA operating in Africa

Rwanda

Kenya

Kenya

Grocery Store Manual Operations

Traditional Solution
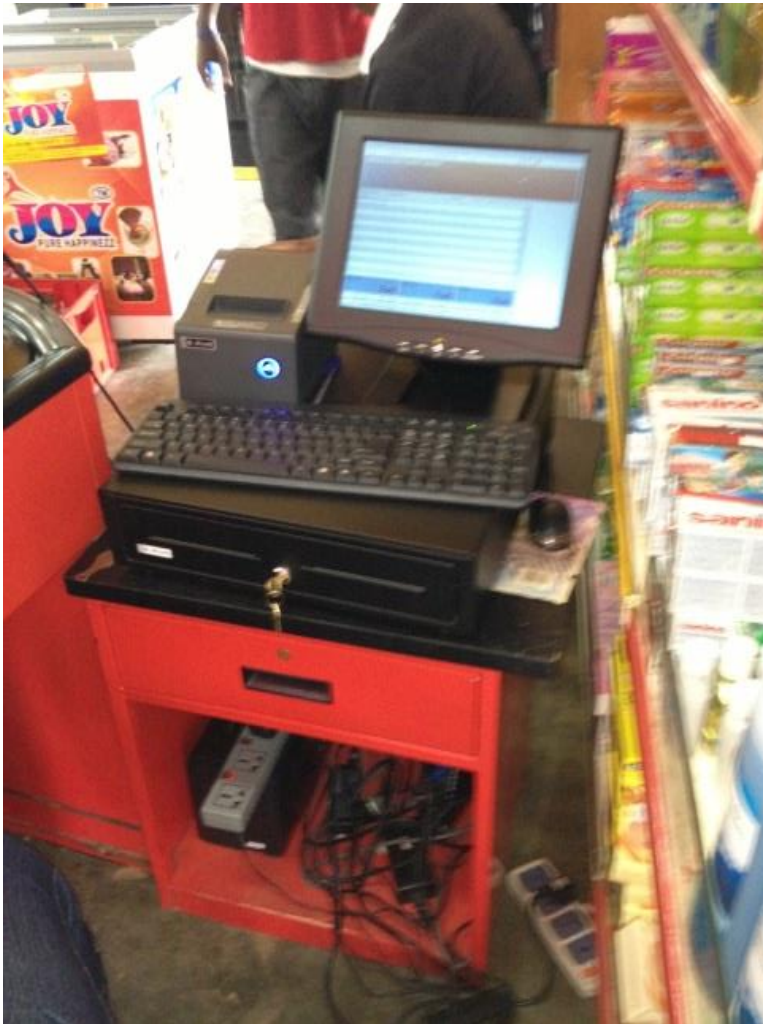
Device	Power	Cable
Surge protector	1	
PC	1	
Screen	1	1
Keyboard		1
Mouse		1
Printer	1	1
Scanner		1
TOTAL	**4**	**5**

Cost: $2,600

Mobile Solution

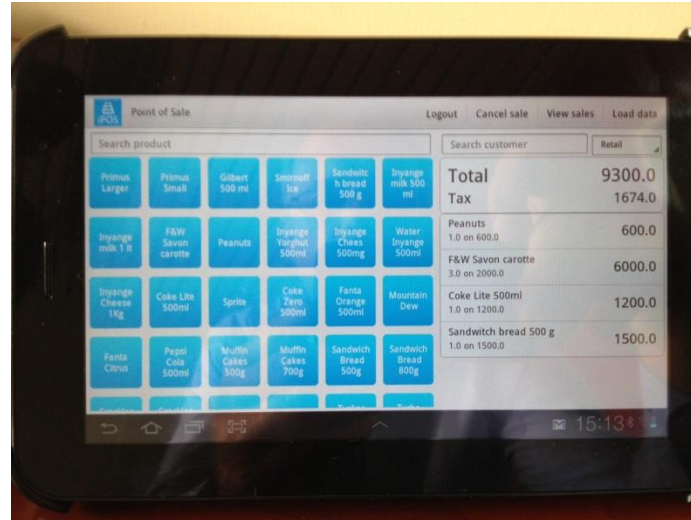| Device	Power	Cable
Tablet	battery	
Printer	battery	blue tooth
Scanner	USB	1
TOTAL	**0**	**1**

Cost: $500

Screen: integrated in tablet

Keyboard: integrated in tablet

Mouse: replaced by touch mode

iPOS Mobile Solution

◆ Time reduction: 30-55%

◆ But not most important…

   ◆ Data

◆ Challenge:

   ◆ Social/Cultural acceptance

Africa's Challenges

◆ **Identify the right partners (Public-Private Partnership)**

  ◆ Major cloud provider have no plans to deploy cloud infrastructure in Africa

    ■ Governments need to take leadership in the deployment of regional cloud data centers

    ■ Natural partners for hosting cloud data centers are telecommunication companies (telcos)

      ■ M: Telcos are the providers of mobile technology to SMEs

      ■ B: Telcos are the Internet providers after their recent broadband cable investments

      ■ C: Telcos have data centers in all major metropolitan areas and the skilled IT resources

◆ **ISV*s must deliver local business applications that meet local needs and that are appropriately priced**

  ◆ This requires local ISVs developing business applications with designs that meet local realities, not those that worked in the developed world

  ◆ They must rely on local innovation to deliver sustainable and appropriate solutions

  ◆ They must build low-cost solutions that are easily absorbed by local businesses.

    ■ Free open source software (Linux, Android,…) can address these higher costs. Canonical, a South African ISV is offering Ubuntu, one of the best free versions of Linux.

* Independent Software Vendors

Africa's Challenges (cont.)

◆ **Develop critical mass of local ICT expertise**

  ◆ Governments need to promote the development of education curriculum in computer and information science from primary school to local universities

  ◆ Governments need to provide the environment for the development of ICT private sector

    ■ Incubation centers

    ■ Technology parks with tax incentives

    ■ Access to financing and protection of intellectual property.

◆ **ICT adoption by SMEs who have little IT knowledge**

  ◆ SSA should tap into the extraordinary good will that is directed towards developing countries

    ■ Individuals who wish to play a bigger role in resolving global issues by contributing know-how, services, and mentoring, such as retired or active senior executives, business students, or financial sector experts.

    ■ Diaspora members, who wish to support entrepreneurs in their homelands with remittances, informal financing, and business advice and mentorship.

    ■ A reverse "brain drain" of African professionals, who were hit by the recent economic downturn in industrialized countries, and wish to spur growth in their native countries.

Conclusions

◆ SMEs generate most employment in Africa

◆ The integration of new ICT (MBC) delivers new affordable and appropriate solutions to increase SME's productivity and revenue with very short time to value

◆ New innovative and appropriate ICT solutions must be developed in Africa for Africa

◆ Public-Private Partnerships (PPP) between local governments, private sector, universities and local innovative entrepreneurs are needed to succeed

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bezy@andrew.cmu.edu