



# ***ICTs in Education Challenges and Issues***

Alex Twinomugisha

Global e-Schools and Communities Initiative (GeSCI)

[www.gesci.org](http://www.gesci.org)

# The Challenges

- **As ICTs become increasingly integrated into education, educational managers and decision makers faced with major problems:**
  - How to plan for technology, when ICTs are not their core competence
  - How to get to grips with the true cost of ICTs in Education
  - How to select one technology solution over another with many options available

- Lack of focus on educational objectives
- ICTs = Computers only
- Failure to consider all the elements of the end-to-end system (focus on technology platform only)
- Failure to consider short term as well as long term costs or Total Cost of Ownership (TCO)
- Forever pilot syndrome



- ICTs have no impact on teaching and learning
- ICTs breakdown frequently with no money for repairs
- ICTS are too expensive for schools
- No scalability

# Need to rethink approach

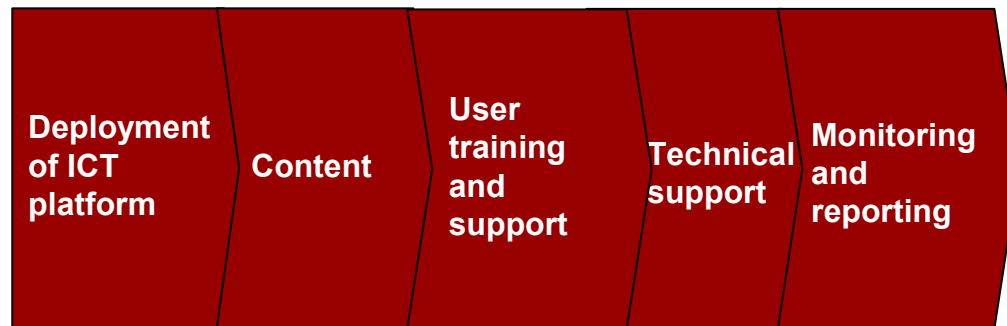


gesci®

Key Inputs

End-to-End System

User



- Think about deployment of ICTs holistically
  - Target an end-to-end system
- Focus on Education Objectives
  - ICTs are only a tool and not an end in themselves
- Consider short term as well as long term costs
  - Total Cost of Ownership
- Consider a multi-stakeholder approach
  - Involve all partners

# Consider whether you can achieve your education objectives

## Educational Objectives



### Deployment models

		Administration		Teacher development		Learning development				ICT skills		
		Enhancing school productivity	Enhancing data flow for policy making	Improving teaching practice	Assisting effective lesson planning	Accessing information (by students)	Improving conceptual understanding	Developing constructivist skills	Facilitating collaboration	Providing testing and feedback	Developing basic ICT skills	Developing advanced ICT skills
Teacher and admin office use	Interactive un-networked	①										
	Interactive w/internet	②										
Mobile device assigned to teacher	Interactive un-networked	③										
	Interactive w/internet	④										
In-classroom single device mainly used by teacher	Non-interactive	⑤										
	Interactive un-networked	⑥										
	Interactive w/internet	⑦										
In-classroom multiple devices used by teacher and students	Interactive un-networked	⑧										
	Interactive w/internet	⑨										
Computer lab with multiple devices used by teacher and students	Interactive un-networked	⑩										
	Interactive w/internet	⑪										
Open access	Non-interactive	⑫										
	Interactive un-networked	⑬										
	Interactive w/internet	⑭										

# COST BENEFIT ASSESSMENT



gesci®

- **Total Cost of Ownership (TCO)**
  - Assess all short and long term costs of deploying ICTs from “cradle to grave”
  - Cost of each item = Quantity or amount of item purchased X Total cost of item X Inflation rate factor
- **Benefits Assessment**
  - Extent and Feasibility of achieving given education objectives
  - Frequency of teacher ICT-interaction
  - Maximum amount of teacher-ICT contact time possible (in a given school week)
  - Proportion of classes where ICTs can be used as learning resource
- **Assess Feasibility**
  - Ensure that selected solutions are feasible by understanding local conditions/ constraints



# TCO Considerations



## End-to-end system

### Upfront/capex

- |   |  |   |   |   |
|---|--|---|---|---|
| <ul style="list-style-type: none"> <li>• Initial purchase, delivery and setup of equipment               <ul style="list-style-type: none"> <li>– Access device</li> <li>– Display device</li> <li>– Connectivity</li> <li>– Software OS and apps</li> <li>– Peripherals</li> <li>– Physical infrastructure</li> <li>– Electrical system</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Off-the-shelf content</li> <li>• Custom-developed content               <ul style="list-style-type: none"> <li>– Development/customization</li> <li>– Distribution</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Initial administrator, teacher and student training</li> </ul> | <ul style="list-style-type: none"> <li>• Setup of support infrastructure (if not outsourced)               <ul style="list-style-type: none"> <li>– Maintenance</li> <li>– Technical support call center</li> <li>– Etc.</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>• Setup of organization (e.g., PMO)</li> </ul> |
|---|--|---|---|---|

### Ongoing/opex

- |  |   |  |  |  |
|--|---|--|--|--|
| <ul style="list-style-type: none"> <li>• To-school connectivity</li> <li>• Electricity</li> <li>• Security</li> <li>• Insurance</li> </ul> | <ul style="list-style-type: none"> <li>• Upgrades in content</li> </ul> | <ul style="list-style-type: none"> <li>• Recurring training for select admin and teachers</li> <li>• ICT training for students</li> <li>• Pedagogical support</li> </ul> | <ul style="list-style-type: none"> <li>• Maintenance and upgrades of all components of ICT platform</li> <li>• Technical support</li> <li>• Insurance</li> </ul> | <ul style="list-style-type: none"> <li>• Ongoing personnel for monitoring, evaluating and reporting</li> </ul> |
|--|---|--|--|--|

# EXAMPLE: ASSUMPTIONS FOR RUNNING TCO MODEL

## GENERAL ASSUMPTIONS

### School context

Number of students: 800  
 Number of teachers: 40  
 Number of classrooms: 20  
 Number of teacher/admin offices: 4  
 Number of computer labs: 1  
 Number of school weeks: 35

### Device specific

Life cycle of all new hardware: 5 years  
 Life cycle of all refurbished hardware: 3 years  
 Life cycle of all software: 5 years

## CONTEXT SPECIFIC ASSUMPTIONS

	Computers in Teacher Offices	Laptop per Teacher	1 Computer per classroom
Security modification to rooms	✓		✓
Electrical generator/ power backup			
Electrical system modification	✓		

## USAGE APPROACH SPECIFIC ASSUMPTIONS

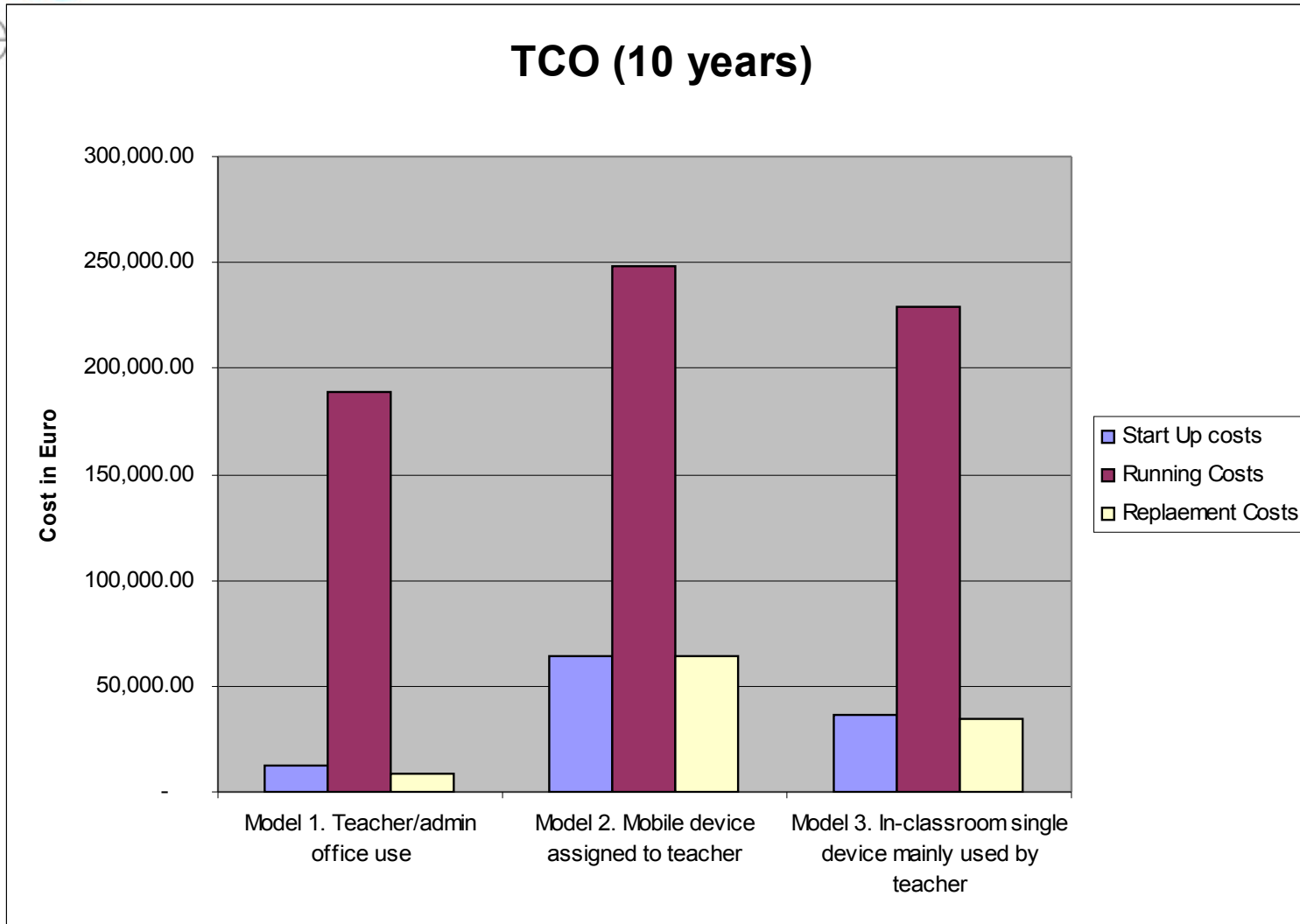
	Total number of devices	Printers**	Server	LAN
Teacher/admin office use	10 Desktop PCs (2 per office, no projectors)	1 per school	Yes	Wireless
Mobile devices assigned to teacher	40 Laptops (sharing 20 Projectors)*	1 per school	Yes	Wireless
In-class single device use	20 Desktop PCs (with 20 Projectors, 1 per room, 10 rooms)	1 per school	Yes	Wireless

\* Since only half of the teachers will be teaching at one time

\*\* No other peripherals other than printers assumed



# Example: TCO Results



# Example: Cost-benefit analysis

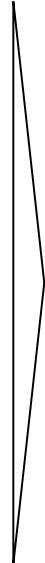


	Total Initial Costs (Euro)	Proportion of time per week each teacher can access ICTs for admin or professional purposes (out of total of 60 hours)	Proportion of classes where ICTs are used as a learning resource (out of 40 hours of regular time)	Proportion of time per week each student has to direct/hands-on access to ICTs (out of 20 hours of after hours usage)	Extent to which deployment approach achieves educational objective (out of 4 corresponding to "balls")
Model 1: Teacher/admin office use	210,193	17%	0%	0%	<ul style="list-style-type: none"> <li>-Enhancing school productivity -4</li> <li>-Enhancing data flow for policymaking -4</li> <li>-Improving teaching practice -4</li> <li>-Assisting effective lesson planning -4</li> <li>-Accessing information (by students) -0</li> <li>-Improving conceptual understanding -0</li> <li>-Developing constructivist skills -0</li> <li>-Facilitating collaboration -0</li> <li>-Providing testing and feedback -0</li> <li>-Developing basic ICT skills -0</li> <li>-Developing advanced ICT skills -0</li> </ul>
Model 2: Mobile devices assigned to teacher	376,583	67%	100%	0%	<ul style="list-style-type: none"> <li>-Enhancing school productivity -3</li> <li>-Enhancing data flow for policymaking -3</li> <li>-Improving teaching practice -4</li> <li>-Assisting effective lesson planning -4</li> <li>-Accessing information (by students) -0</li> <li>-Improving conceptual understanding -4</li> <li>-Developing constructivist skills -1</li> <li>-Facilitating collaboration -1</li> <li>-Providing testing and feedback -1</li> <li>-Developing basic ICT skills -1</li> <li>-Developing advanced ICT skills -0</li> </ul>
Model 3: In-class single device use	300,728	17%	100%	3%	<ul style="list-style-type: none"> <li>-Enhancing school productivity -2</li> <li>-Enhancing data flow for policymaking -2</li> <li>-Improving teaching practice -2</li> <li>-Assisting effective lesson planning -2</li> <li>-Accessing information (by students) -0</li> <li>-Improving conceptual understanding -3</li> <li>-Developing constructivist skills -1</li> <li>-Facilitating collaboration -1</li> <li>-Providing testing and feedback -1</li> <li>-Developing basic ICT skills -1</li> <li>-Developing advanced ICT skills -0</li> </ul>



# Understand that local conditions and constraints impact feasibility of deploying and using ICTs

Local conditions/ constraints	Description
1. Teacher skills	<ul style="list-style-type: none"><li>• Educator's technology skills and comfort in integrating technology into teaching</li></ul>
2. ICT infrastructure	<ul style="list-style-type: none"><li>• Existing ICT infrastructure such as computer equipment and <b>telecom connectivity</b></li></ul>
3. Electricity	<ul style="list-style-type: none"><li>• Availability of sufficient electricity for ICT usage</li></ul>
4. Physical school infrastructure	<ul style="list-style-type: none"><li>• Size and shapes of classrooms; security; types of furniture; lighting conditions; ventilation...etc.</li></ul>
5. Access to developed local ICT industry	<ul style="list-style-type: none"><li>• Distance from services; capability of local ICT service industry; ease of procurement</li></ul>



Impacts feasibility of deployment models and technology choices, and costs



# Connectivity Challenges

gesci®

- **Too expensive**
  - **Over 50 times as expensive as Europe or US**
    - Monopoly providers/ No competition/ regulation
    - Technology used e.g. VSAT
    - Poor approach to procurement
- **Too little- not enough bandwidth**
  - **Average African university has same bandwidth as a home in Europe**
    - Poor local and national infrastructure
    - Expensive international bandwidth
- **Limited availability**
  - **No connectivity outside major cities and towns**
    - Poorly developed infrastructure
    - Monopoly providers/ regulation
- **Poorly managed**
  - **Bandwidth is an expensive resource that should properly managed**
    - Lack of policies
    - Lack of skilled staff



# What can we do?

- **Too expensive**
  - Collaborate to aggregate demand and purchase volumes
  - Explore alternative delivery mechanisms e.g. offline solutions
  - Manage your bandwidth better
  - Review various technology solutions
  - Lobby governments for lower costs/ deregulation
- **Too little- not enough bandwidth**
  - Define educational needs carefully to determine actual requirements
  - Manage your bandwidth better
  - Explore alternative delivery mechanisms e.g. offline solutions
  - Collaborate to lower costs and purchase more
- **Limited availability**
  - Explore alternative delivery mechanisms e.g. offline solutions
  - Consider newer wireless/ 3G solutions
  - Lobby governments to deregulate
  - Tap into existing resources e.g. USF
- **Poorly managed**
  - Define educational needs carefully to determine actual requirements
  - Manage your bandwidth better
  - Build capacity of staff



# Various models to consider

gesci®

- **NRENs**

- **Whole education and research sector collaborative approach**

- **E-Rates**

- **Subsidized/ special rates for education and research sector**

- **Purchasing consortia**

- **Aggregate demand**

- **Deregulation**

- **Entire communication sector change**

**-> Model to adopt will depend on your own particular context**



**Any Questions?**