Communicating Value of ICT using E-readiness indicators and Portal

A presentation at ICT directors Forum

April 10, 2015

Intercontinental Hotel, Nairobi

Agenda

- KENET Governance
  - BoT, Membership, Operator
  - Objects and Mission
- KENET as the National Research and Education (NREN) of Kenya
- History , Motivation and Key Results of the E-readiness Survey Research Series 2006 – 2015
  - 2006, 2008, 2010, 2013, 2015 E-readiness survey
  - Engineering and ICT Departments 2014 Baseline Study of Group of 30 Universities
  - Medical Schools baseline survey
- Using the E-readiness Portal to Communicate Value of ICT to Senior Leadership
- Conclusions and Recommendations

KENET Governance

- KENET is constituted as a not-for-profit TRUST with 10 Registered Trustees
  - Seven Vice Chancellors + PS Education + DG CA, CEO, KEMRI as 10 Trustees
  - Governed by Board of Trustees, Assisted by Management Board (10 members)
  - www.kenet.or.ke
- KENET is a membership organization and only serves members – it is NOT a business
- KENET licensed as a Alternative Network Facilities Network Operator since 2002
  - Builds and operates national broadband IP network
- KENET is an implementation agent of the Government of Kenya, Infrastructure donors (KTCIP, Google, Foundations etc) and Member institutions
  - Partnerships for research and infrastructure expansion
- KENET is the National Research and Education Network (NREN) of Kenya
  - One of the Largest NREN in Africa in terms of campuses and traffic generated
  - *Is an NREN > ISP or commercial operator?*

We build capacity of institutional ICT staff

Build a community of Public and Private University VCs
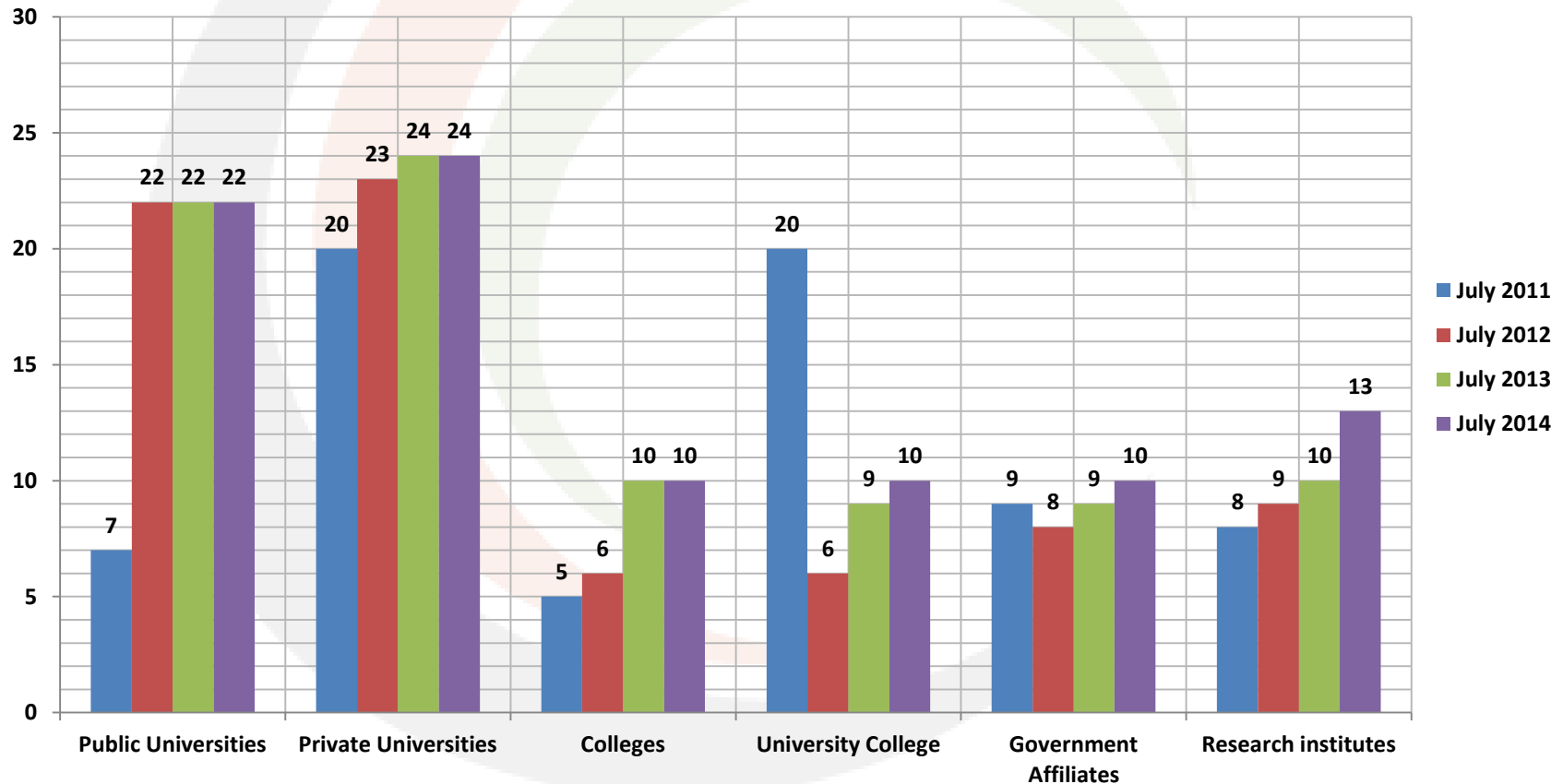
KENET Mission and Core Values

- KENET's mission is to be a catalyst for transformation of research and education in Kenya
  - Catalyst for improved quality of research and increased productivity
  - Anecdotal evidence suggests that aggregated ICT readiness results have been useful for triggering institutional action and review of ICT strategic plan targets
  - *Small innovation projects trigger huge institutional-wide investments in e-learning or engineering education tools*
- KENET Strategic Plan 2011 – 2016 (www.kenet.or.ke)
- Core values include:
  - **Diversity** (e.g., diversity of staff measured as university, county, gender, temperament etc)
  - **Innovation** – in services and promotion of research collaboration
  - Partnerships and collaboration
  - Integrity and ethics
  - Open access
  - **Sustainability**
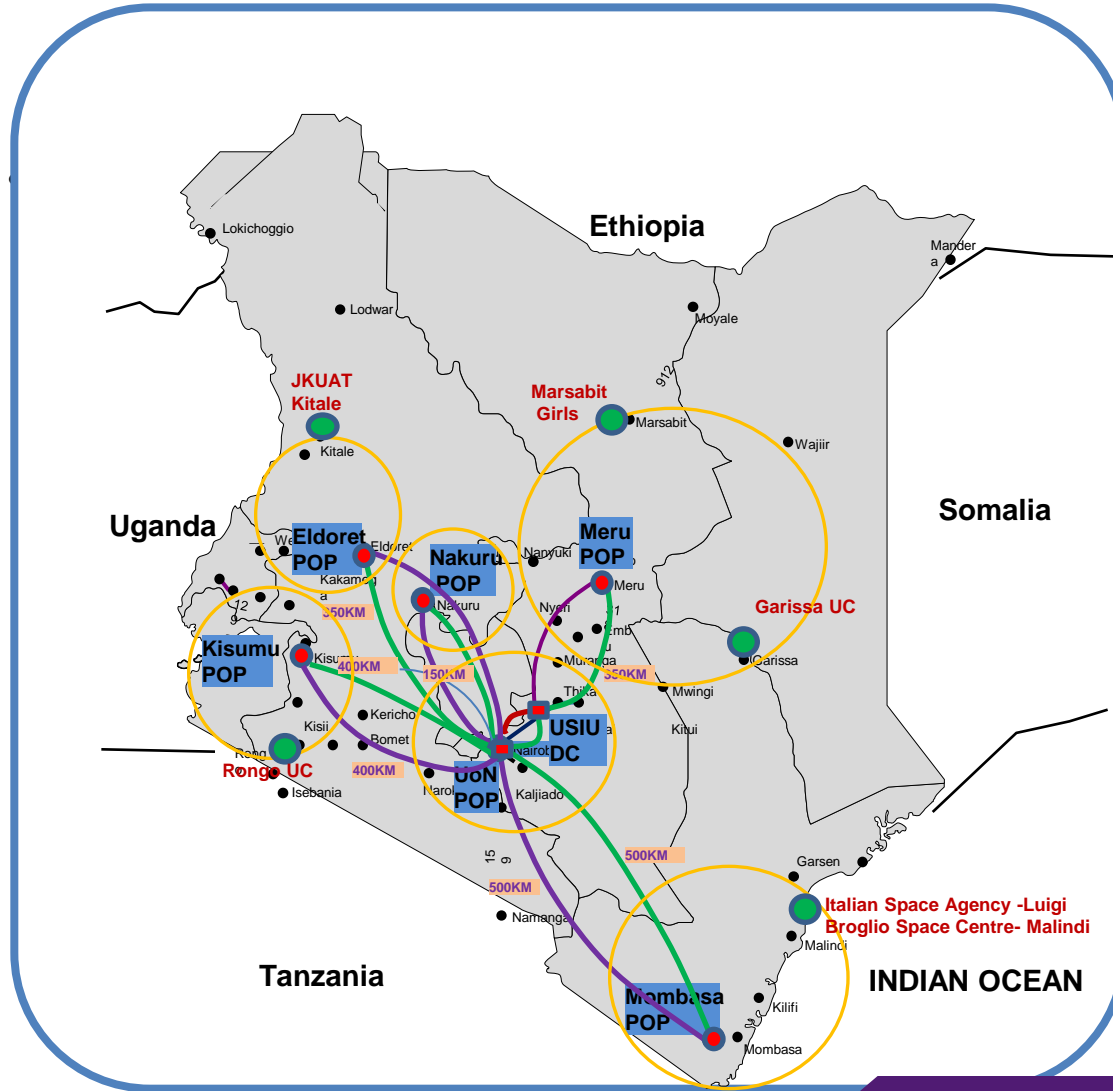
What is the value KENET as a Kenyan NREN?

- **Aggregates HE Demand** for bandwidth and leased lines
  - Increasing buyers power of the higher education sector and reducing costs
  - KENET beneficiary of supplier-financed IRUs
- **Aggregates Internet traffic from Higher Education and institutions**
  - KENET saves 3.5 Gb/s of international Google static and dynamic traffic per day; Saves 500 Mb/s of Akamai international Internet traffic (Facebook, Yahoo, CNN)
- **Develops High-end ICT and network engineering talent** – technical + project management
  - Capacity building for KENET and member institutions
  - 22 high-end technical staff developed in past 5 years – critical for universities
- **Builds advanced research infrastructures for use by Masters, doctoral students and faculty** in all areas
  - Federated research services available (KENET Certification Authority, Identity Provider, EDUROAM available to students, faculty, researchers)
  - *Unfortunately, limited readiness and awareness by faculty and researchers -*

Membership Growth (96 members March 2015)

Membership Growth Categories 2011/2014

Legend:
- July 2011
- July 2012
- July 2013
- July 2014

Data:
- **Public Universities:** 7, 22, 22, 22
- **Private Universities:** 20, 23, 24, 24
- **Colleges:** 5, 6, 10, 10
- **University College:** 20, 6, 9, 10
- **Government Affiliates:** 9, 8, 9, 10
- **Research institutes:** 8, 9, 10, 13

KENET Operates a Broadband Network for Members

Legend:
- Primary fiber links
- Backup fiber links
- 🔴 KENET POP
- 🟢 Furthest connected campus

POP	Connected Campuses
Nairobi POP	80
Kisumu POP	24
Mombasa POP	10
Eldoret POP	16
Nakuru POP	11
Meru POP	22
Total Campuses connected	**162**

Transforming education using ICT

Special Interest Groups – vehicles for collaboration?

- Special Interest Groups
  - Groups faculty and research champions from different universities
  - KENET facilitates group activities and research funds grantee
  - Two groups operational in 2014
- SIG on Educational technology
  - Organizing HE e-learning forum in August 2015
  - Content Development and Capacity Building for Faculty using Open Content
  - Schools Connectivity Initiative
- SIG on Engineering education and research
  - *Baseline survey of engineering and ICT departments 2014 completed*
  - Raspberry PI student-owned labs projects (4 university teams, UoN, DeKUT, USIU, MUST) – see http://raspberry.kenet.or.ke
  - The Future of Engineering Education Forum October 2015
- Other SIGs to be formed in FY 2015-2016
  - Medical education and research; *baseline survey of medical schools ongoing*
  - ICT (computer science and information systems) education and research

Measuring the E-readiness Research in Kenya

- **ICT readiness or E-readiness Essential enhancing quality of education and research in the 21st Century**
  - The Kenyan researcher must be able to collaborate with other researchers in Kenya, Africa, Europe and US etc
  - ICT is an essential part of the research environment
- **Broadband Internet is a recognized Innovation platform**
  - Europe has invested in GEANT, high speed network interconnecting 34 NRENs
  - US has invested in Internet2 – broadband network that interconnects state networks (similar to KENET) to drive innovation.
- **Scientific research has changed** – it is data intensive and distributed (the Square KM Array of Telescopes in SA requires a 10 Gb/s connection to Europe
- Broadband Networks start with broadband institutional campus networks
- E-readiness assessment an attempt to assess campus networks environments for learning, teaching, research and administration
  - Based on hard facts from research institutes + perception data from the researchers and staff
  - Is Infrastructure OK? Are you fully automated? Are the users satisfied with quality of ICT services? Is your ICT Human capacity adequate?
  - Next e-readiness survey November 2015

University E-readiness survey research 2006-2013

Engineering and ICT Departments Baseline Survey 2014 – 2015 (Group of 30 Universities)

February 2015 Student Enrolment Data Collection AY 2014-2015 (All Universities and University Colleges)

Medical Schools Baseline Survey 2015

Motivation

- KENET involved in ICT in higher education advocacy since year 2000 but ..
  - No indicators to measure progress!
  - Some universities were very successful e.g., UoN and USIU
  - Need for data-driven advocacy to influence policy
- How shall we transform Higher Education in Kenya using ICT?
  - Increase efficiency of the institutions
  - Improve learning outcomes?
  - Serve the very large number of students?
  - Promote research collaboration and quality of research?

Measuring academic and administrative value of ICT?

Educational value of ICT

- **Overall quality** = quality of faculty x quality of students x quality of learning environment
  - *Multiplicative*
- **Quality of faculty** = research x level of education x workload
- **Quality of students** = admission criteria x high school standards x competition x discipline
- **Quality of learning environment** = classrooms x libraries x ICT infrastructure x living conditions

Administrative value (e.g., ERPs) –

   Efficiency and reduced cost of operations

E-readiness 2013 Survey

- Project started in September 2013
- Focused on a group of 30 KENET University members with over 2,000 students
  - 42 Campuses were involved
- A statistically significant sample was determined per campus
  - A total of 14,974 students were interviewed
  - Staff respondents derived from 10% of the student sampled (1,497)
- Set of 6 hard facts questionnaires for the group of 30 KENET Universities

2.   Collected Data

- Perceptions data from
  - Students Perception Data
  - Staff Perception Data
- Hard facts provided by senior leadership
  - Administration Registrar
  - University Librarian
  - DVC AA/Director E-learning
  - CFO
  - ICT Directors
  - Dean of ICT/ICT academic head/Engineering

Faculty and Student Participation in Data Collection

- From each campus, a research assistant was recruited
  - 42 RAs most junior lecturers or institutional research people
  - RAs collected data from staff (perceptions and hard facts
  - About 420 students were involved in administering the student's questionnaires
  - 81 students were involved in data entry
    - Data entry forms accessible over Internet but data entry at a central location for quality control

5. Data Collection Process

- All questionnaires were sent to respective campuses by 10th of October
- Student questionnaires ranged between 322 to 382 per campus
  - Average 350
- Average number of questionnaires per enumerator were 35
- RAs collected data from both academic and administrative staff
  - Ranged between 32 to 38 questionnaires per campus

# Why is Collecting Data from Universities so Hard?

- Data collection scheduled for 3 weeks
  - Most RAs did NOT return the questionnaires on time
  - Difficulty in collecting data from senior staff, particularly Finance Officers and Registrars
- Inconsistent data especially expenditure data.
  - Supporting audited financial documents not easily available
- Incomplete and missing data especially academic data ie
  - e.g., Paper published, No of lecturers with PhD, No of students who have graduated with Masters or PhD in the last 3 yrs
- *What data is accessible through the institutional administrative information systems*?
- Fortunately, KENET had full support of the Vice Chancellors!

E-readiness Indicators and Methodology and Results

E-readiness assessment methodology

- Derived from the CID (Harvard) E-society tool, AAU self-assessment tools and experience of researchers
- 17 indicators groups as follows:
  - Network access indicators (4 – Information infrastructure, Internet availability, Internet affordability, Network speed &quality)
  - Networked campus indicators (2 indicators - Electrical power & Security, E-campus)
  - **Networked learning indicators** (4 – Enhancing education with ICTs, Developing the ICT Workforce, ICT in Libraries, ICT research and innovations)
  - **Networked society indicators** (4 indicators – Locally relevant content, People and Organizations Online, ICTs in Everyday life, ICTs in Workplace)
  - **Institutional ICT strategy** (ICT strategy, ICT financing, ICT Human Capacity)
- Stage each indicator on a scale of 1-4 for each indicator (unprepared to ready)
- Over 90 sub-indicators staged to derive the 17 indicators

Overall 2008/2013
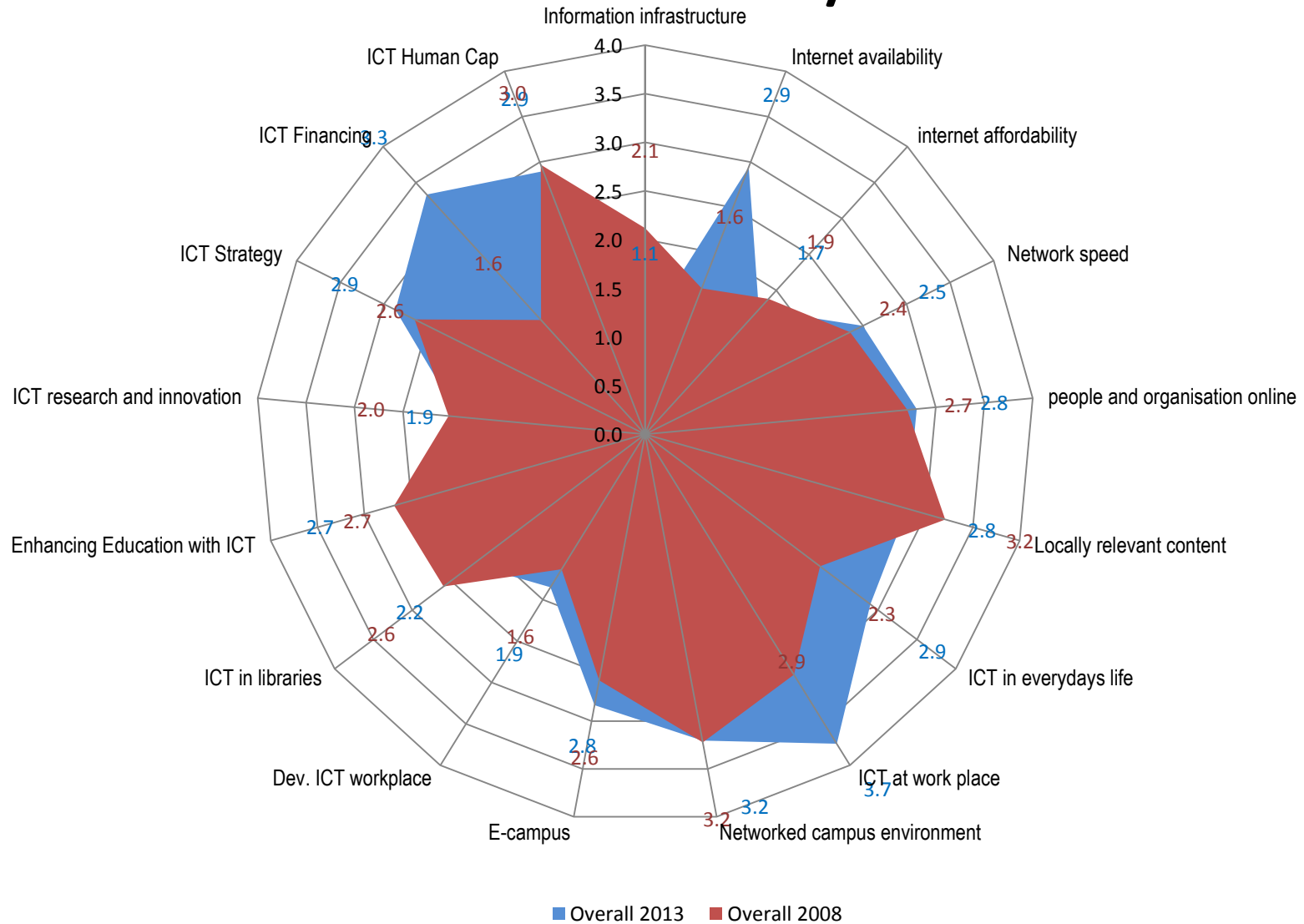
Classification of Universities and Internet Availability in Universities (2013)

| Category	Number of Institutions	Total Number of students	Total Bandwidth (mb/s)	BW per 1000 students	PCs per 100 students
>30,000 students (Very Large)	4	224,804	770	3.5	4.7
10,001 -30,000 students (Large)	6	88,417	275	3.3	2.0
5,000 - 10,000 students (Medium)	13	84,418	422	5.0	4.0
<5,000 students (Small)	7	26,025	231	10.1	5.4
Total	30	423,664	1,699	4.0	3.8

E-readiness Survey Portal

- Http://ereadiness.kenet.or.ke

- Downloadable 2006, 2008, and 2013 reports

- Institutional e-readiness results available on login (demonstrate if there is time)
- All raw data available in SPSS format
  - Masters and PhD students have access to data in aggregated form

Access to Online E-readiness results

| Designation	Registered	Total	% registered	Comments
ICT Directors	28	30	93.3	2 ICT directors did not register!
Librarians	12	30	40.0	
Deans of ICT/Engineering	10	30	33.3	
Directors E-learning	10	15	66.7	
CFOs	5	30	16.7	
Registrars	4	30	13.3	
DVC AAs	1	15	6.7	No interest from DVC AAs
VCs	2	30	6.7	
Research Assistants	33	42	78.6	
Total	**105**	**252.0**	**41.7**	
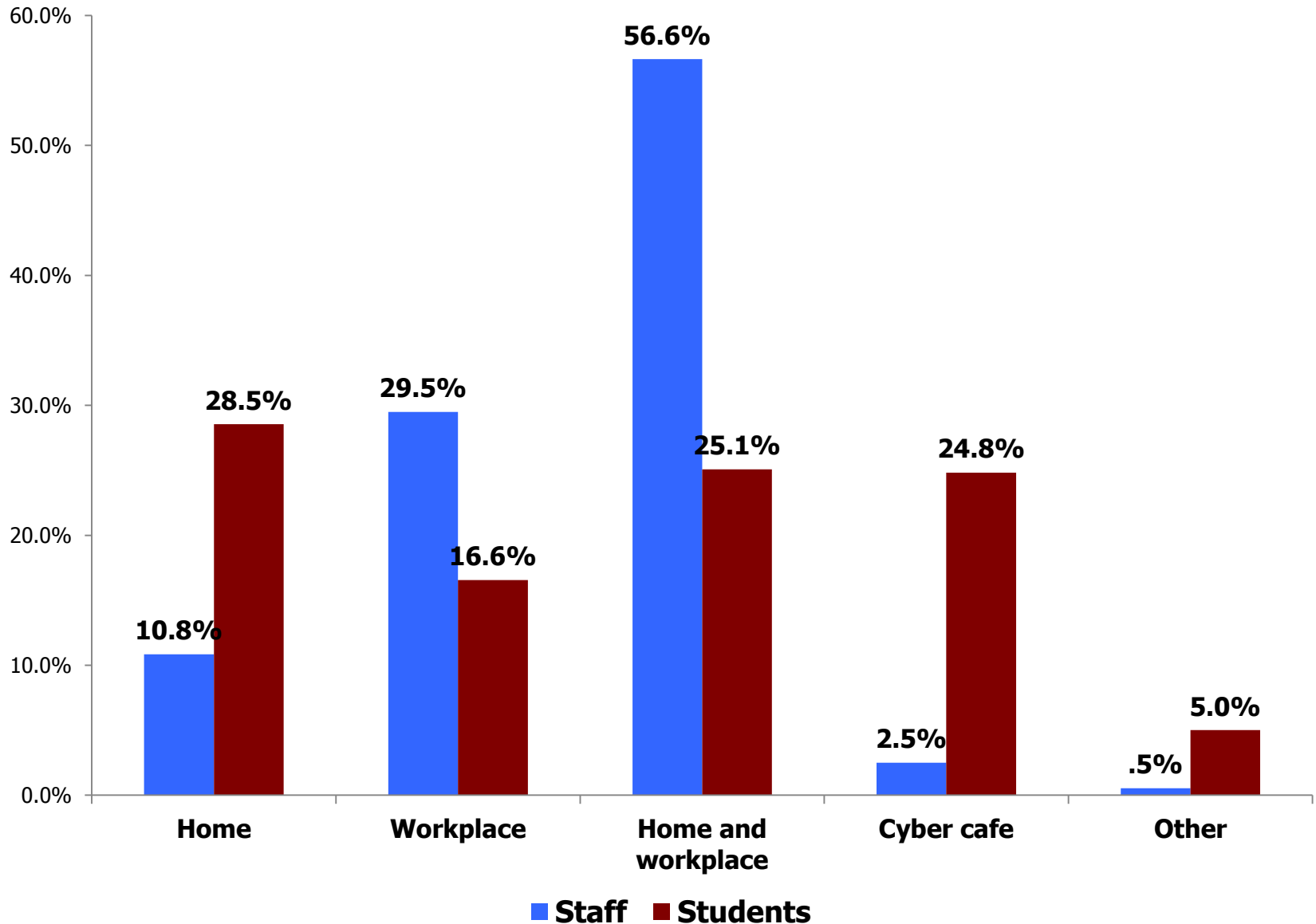
Are Campus Networks Ready?

- **30 Universities had only 16,174 student lab computers for the 423,664 students!**
  - **So only 17% of students access computers on campus**
  - **And 52% of students think campus networks unstable (and slow!)**
- **53% of students owned laptops (= 220,000 laptops) + 17% own desktop computers (= 70,000 desktops)!**
  - **Only 13% of laptops on campus networks**
- ***Campus Networks need massive infrastructure upgrade to accommodate 300,000 additional student computers up from 16,174!***
  - **Optical fiber backbone , dense Wi-Fi networks, automated on-boarding**
- ***But suppose students fear bringing laptops to campus? How about Power availability for charging?***

Messages

- **Huge increase of Internet availability (stage 1.6 – 2.9)**
- **25% of the 423,664 enrolled students still used cyber cafés for primary computer and Internet access**
- **52% of students considered the campus networks unstable**
- **Internet affordability**
  - **All universities below stage 2**
  - **Most of the large and very large universities in stage 1! (< $13,000 per 1,000 students)**
  - **Universities spending about 0.5% recurrent expenditure on Internet => Internet is affordable**
- **Anecdotal evidence suggests that many campus networks were still not optimized and campus wireless networks were not well managed**
- **Massive investments in campus networks and power infrastructure to support BYOD**

Networked campus: Overall staging
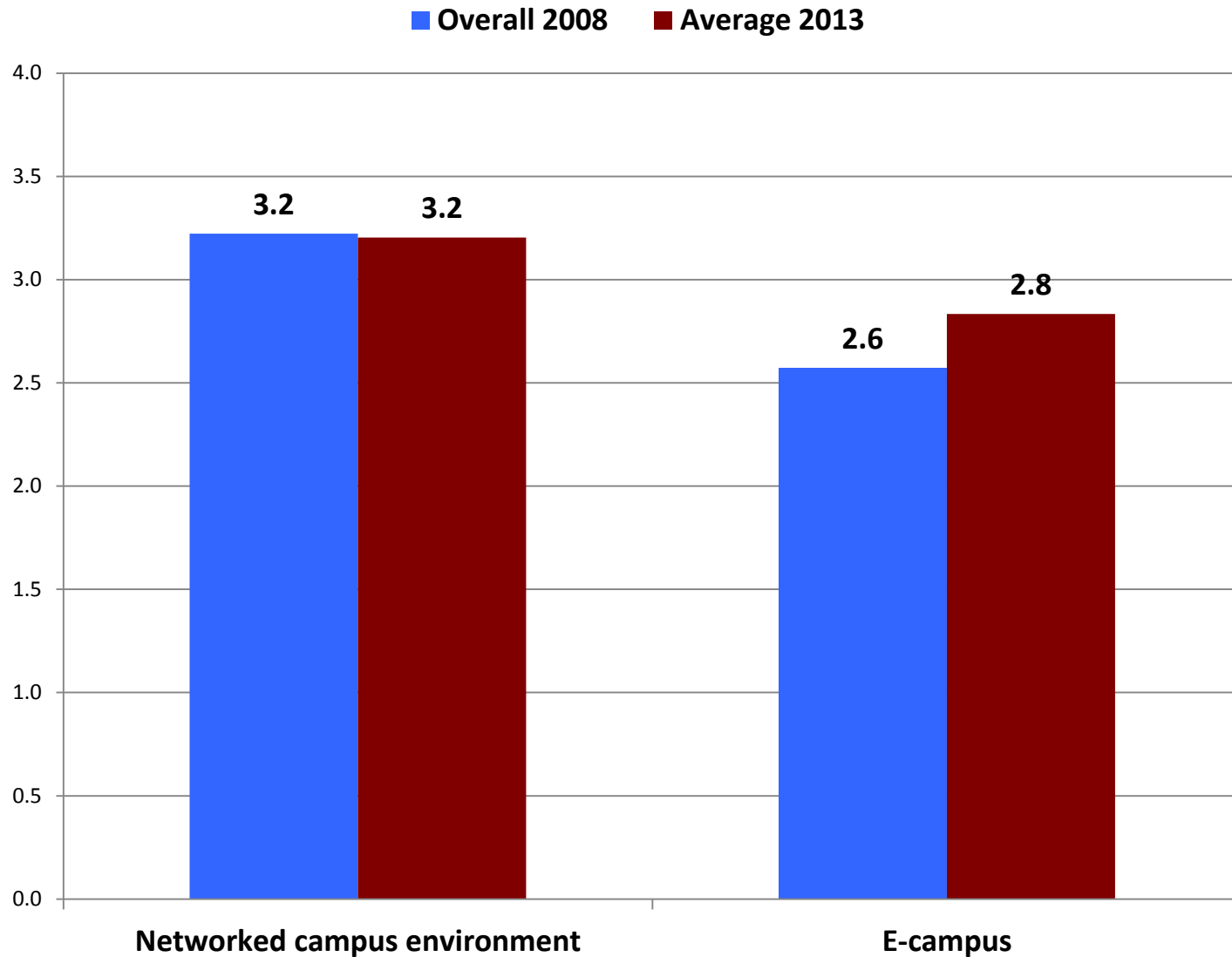
Are we OK in networked campus readiness?

- **Network environment**
  - **77% of all institutions had UPSs for PCs in the offices**
    - **But only 57% of the 16,000 PCs in the student labs were on UPS**
  - **100% of the campuses had backup diesel generators for all their ICT equipment**
    - *But no data on availability of backup generators collected*
  - **90% of the universities had a firewall to protect their Intranets (cf 70% in 2008)**
    - *Firewalls can be the campus network bottleneck*
  - **17 of 30 universities had offsite backup and only 10 had a disaster recovery plan (this is a disaster!)**
- **E-Campus**
  - **33% updated their institutional websites on a daily basis; mainly informational NOT transactional or interactive**
  - **Automation of core systems was ongoing but**
    - ***Perception data collected from faculty, staff and students indicated a low level of automation and not web-based !***

7 out 30 ICT directors Summarized Institutional Discussions!

1. Ibrahim Otieno – University of Nairobi

2. Moses Thiga – Kabarak University

3. Martin Njogu – Strathmore University

4. Anthony Gachatha – UE University, Baraton

5. Annette Okello - CUEA

6. Anthony Mbaabu – Kenyatta University

7. Karen Kibuchi – St Paul's University

Presentations to Senate or Faculty or Senior Leadership

- Moi University – included ICT and Library staff + Directors of Quality Assurance and Innovation

- Kenyatta University – Senate

- KEMU – Senior Leadership

- Egerton University – ICT Committee made of senior leadership

- Chuka University – ICT Faculty and ICT staff

- USIU – ICT director and Vice Chancellor

Some Observations

University	Internet Expenditure per 1,000 students	Campus Networks perceived as unstable / Target for laptop ownership	Telephony Infrastructure	Has Internet BW Target 10 Mb/s per 1,000 achieved?	Who is responsible for management of Backup generator
UoN	$11,000 per 1,000 students; computer charge	Lack of ICT capacity / No target	Limited use of office phones!	5 Mb/s per 1,000 students	ICT staff
KU	Internet expenditure target < $13,000 per 1,000 students ; no computer charge	Inadequate no. of network admins / 80%	IP Phones very expensive	Not yet	Maintenance staff, works well
SU	Focused on networked learning		Surprised!	Yes	-
UEAB	> $13,000 per 1,000	Power stability on campus	Investment on IP phones	Yes	Maintenance

Observations and Conclusions

- Data collection from Universities is a very slow process!
  - Institutions and campuses not fully automated (integrated)
  - Universities do not seem to be using the data for decision-making, especially on faculty and research productivity and graduate students
  - Financial information is confidential
  - Institutional data departments not yet established at most of the universities
- KENET is trusted by universities
- Data collection is expensive with research assistants (to see senior administrators)
  - *Online tools will not work*

Who is / should be ICT Champions in your University?

- Champions have influence in the organization

- Believes ICT matters for achievement of University Mission

- Communicates the value of ICT to the university
  - Based on some agreed / accepted targets

Additional Results from E-readiness 2013 report

Demographic data for group of 17

| Year of Survey	Total students	Total students PCs	Total Bandwidth (Mb/s)	Bandwidth per 1000 students	PCs per 100 students	% of students with PC access at home
2008	162,319	8,907	70.8	0.436	5.5	27
2013	339,418	13,815	1431.5	4.22	4.07	30.4

- **Inferences:**
  - **109% increase in students**
  - **10 times increase in bandwidth per 1,000 students**
  - **93% decrease in cost of bandwidth**
  - **21 times increase in total bandwidth**
  - **Decrease in PC:student ratio (5.5:1 to 4.1:1) – due to huge student increases. Framework target is 10:1**

More results & inferences

- **Students numbers growing faster** than campus learning environments
  - New campuses of universities have low stages of readiness
- **Device ownership is high** – smartphone and laptops but teaching style has not changed
  - Over 60% smartphones, over 50% laptops
  - Faculty leadership; DVC AA and Deans must lead
- **73% of students prefer blended learning**
  - But only 11% of students reported they had taken all or nearly all blended courses!
- **Faculty are ready to use technology**
  - But only 24% reported a few of their courses were blended
  - Support innovations in teaching
  - Build capacity in blended and online teaching

Perspective on nature of website

	Students	Staff
Information web site	67.0	69.5
Interactive web site	18.2	21.8
Do not know	14.8	8.7
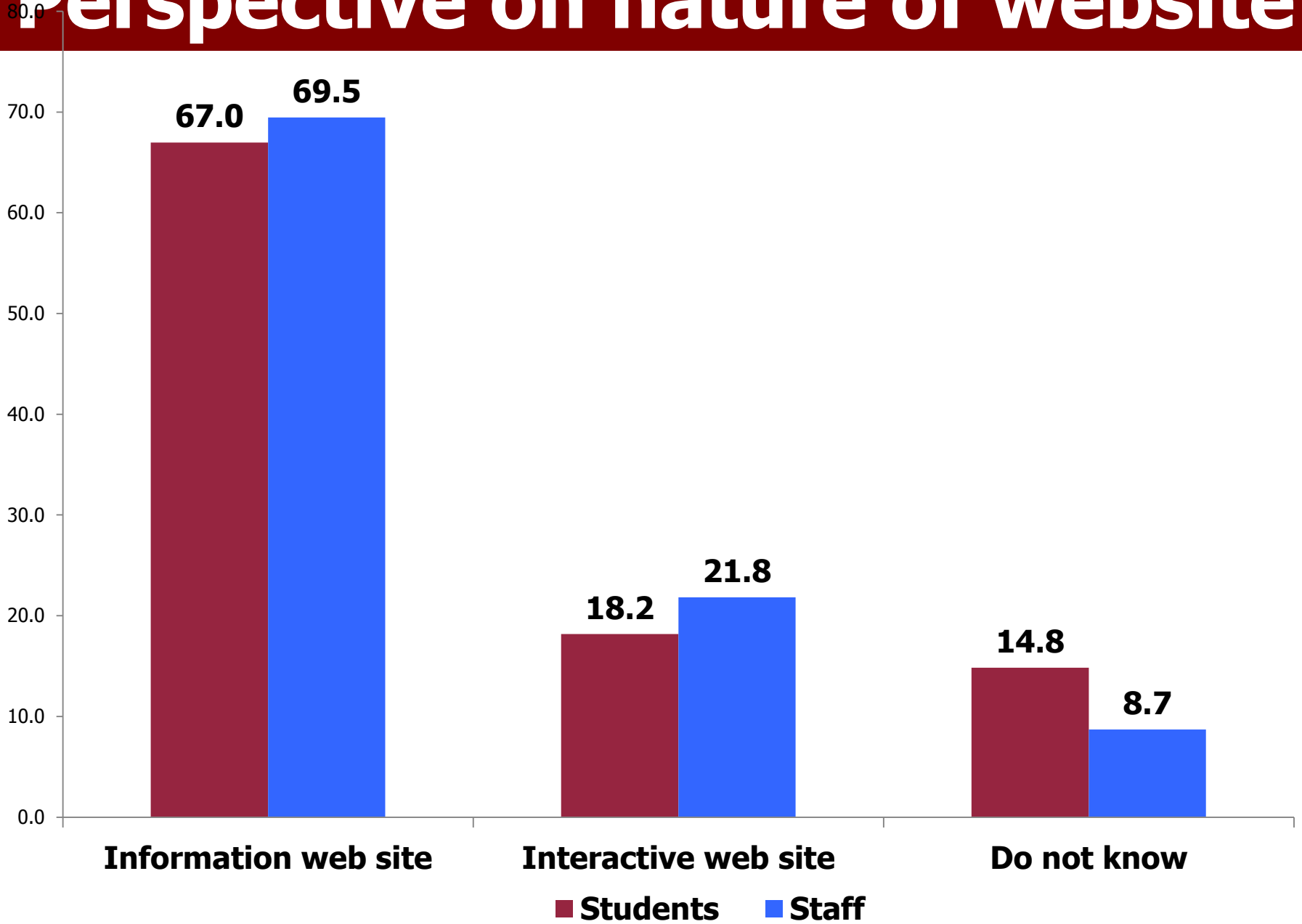
Messages

- **Interactive websites**
  - **18.2% of students thought their institutional website was interactive (stage 3). Stage 4 requires at least 25% .**
  - **Almost 70% of users thought their websites were informational**
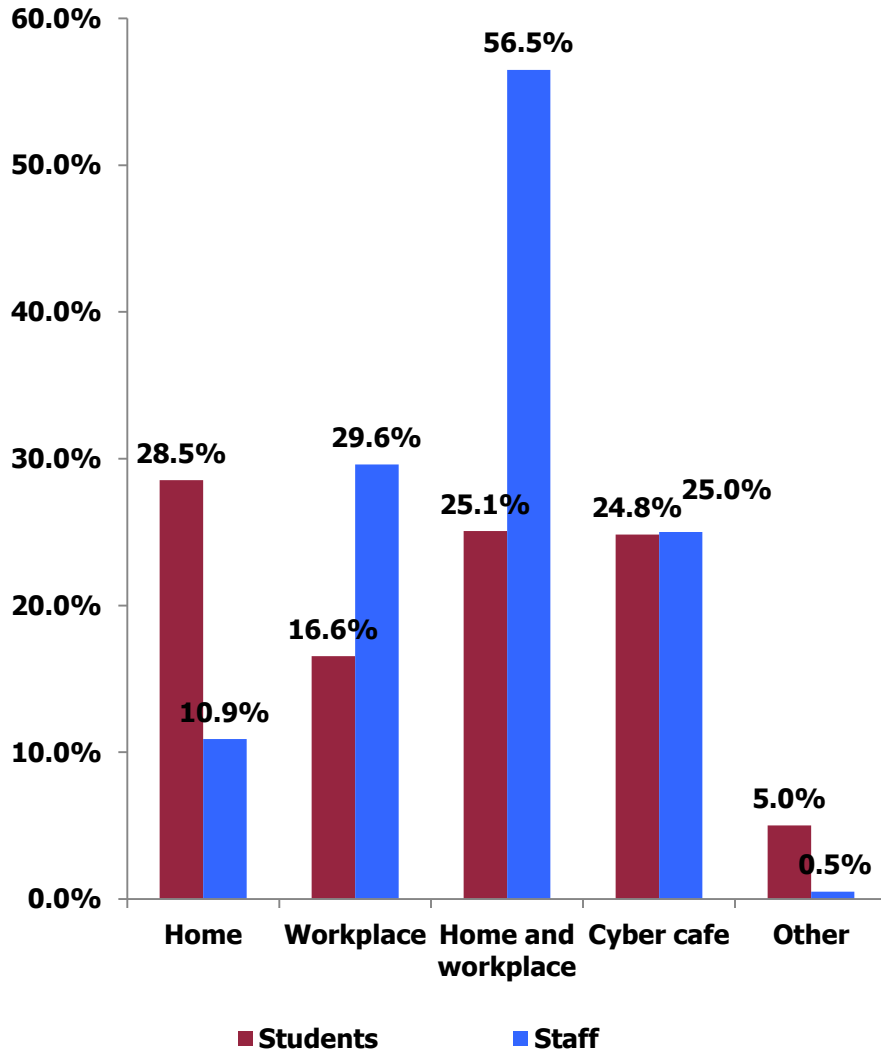 - **=> universities surveyed will need to make their websites more interactive**
    - **This would require automating their internal processes and establishing operational information systems and linking these systems to the institutional portals**
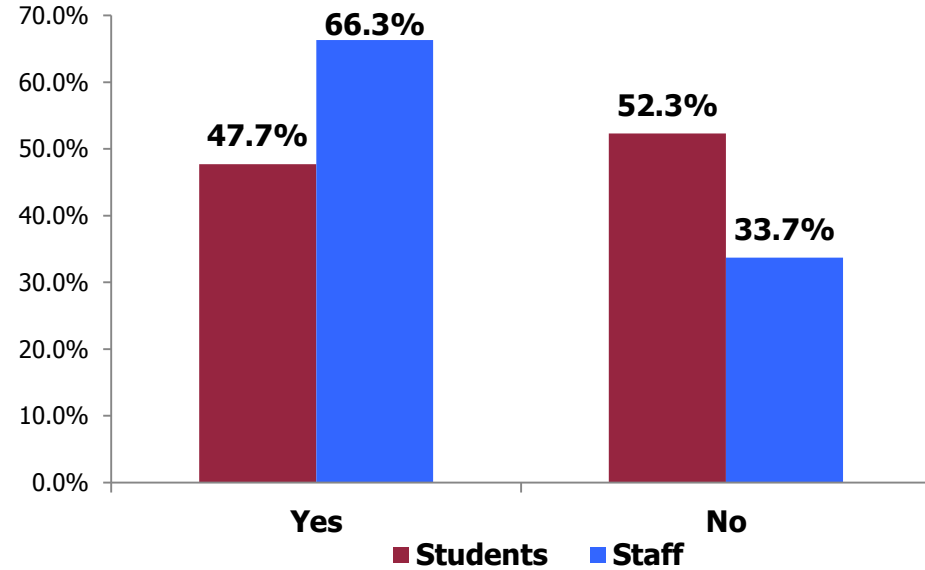- **Locally relevant content**
  - **42.9% of students and 39.7% of faculty reported regularly visiting one or two local websites (i.e., contain local information). This is stage 3, down from stage 4 in 2008**

Access to computers

Location of access to computers

Students / Staff

- Home: 28.5% / 10.9%
- Workplace: 16.6% / 29.6%
- Home and workplace: 25.1% / 56.5%
- Cyber cafe: 24.8% / 25.0%
- Other: 5.0% / 0.5%

Internet speeds better than cyber cafes

Students / Staff

- Yes: 47.7% / 66.3%
- No: 52.3% / 33.7%

Ownership of a laptop

- Yes: 52.8
- No: 47.2
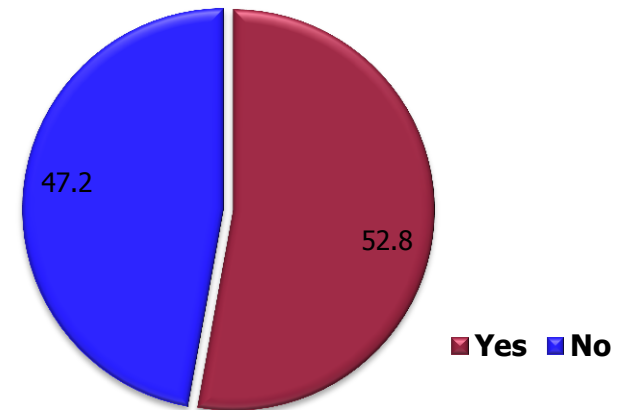
Perceptions on the value of ICT

- **Data collection** from senior staff:
  - Librarians
  - ICT Directors
  - Deans of ICT
  - CFOs
  - Registrars
  - DVCs (AA)
- **Focus on perceptions** of the impact or value of ICT
- Impact measured on a **5-point linear scale**
  - 1. Strongly disagree to 5. Strongly agree
- **Data analysis:**
  - Consider significant where the total of percentage that Agree (4) plus percentage that Strongly agree (5) is greater than 75%

Results

	DVC AA	Dean ICT	FO	Regi-strar	Libra-rian	Director ICT
Enhanced quality of teaching	✔	✔				✔
Enhanced quality of learning	✔	✔				✔
Improved research productivity		✔				
Expanded research opportunities	✔	✔				
Enhanced competitiveness	✔				✔	
Reduced op. costs	✔		✔	✔	✔	
Enhanced revenue						
Enhanced opportunities for revenue generation	✔					
Increased efficiency	✔		✔	✔	✔	✔
Improved QoS delivery	✔	✔	✔	✔	✔	✔
Increased transparency & accountability	✔		✔	✔	✔	

Observations

- **The respondents agreed or strongly agreed with the outcomes that relate to them, although some went beyond e.g.**
  - **DVCs (AA) and Academic Deans of ICT should only concern themselves with Networked Learning outcomes but DVCs (AA) seem to cover almost all outcomes**
- **Overall, all agreed or strongly agreed that ICT matters or has value**
  - **The Big Question is why the stakeholders had not taken actions to ensure corresponding indicators are equally good (stages 3 to 4)**
- **It is surprising that none of the respondents thought ICT helped to increase revenue**
- **In some instances, there is no correspondence between the indicator staging and the perceptions of impact, e.g.**
  - **Directors of ICT are not best placed to assess Networked Learning outcomes and they seem to think the quality of teaching and learning had improved**

Conclusions

- **Limited accession to higher stages for most indicators** in last 5 years despite senior leadership understanding of the value of ICT
- **High ownership of computers and mobile devices** by students
- **Campus networks** have limited coverage and of low quality – majority did not bring them to campus
- **Low expenditure on ICT** (0.5% on bandwidth, 2.4% on all ICT expenditure)
- V.Low proportion faculty with **PhDs in ICT programs** & MSc and PhD ICT degree programs **throughput** is v.low
- **E-learning**
  - Most universities were not yet offering **blended courses** and even fewer were offering purely **online courses**
  - **About 50% want greater use of e-learning** (51% - use e-books & 44.4% - use of open content)
  - About 25% of students had good/excellent experience in the use of their mobile handsets to access LMS that hosted e-learning courses

Recommendations

- **Implement Bring Your Own Device (BYOD) policies**
  - **Need dramatic expansion of the campus wireless LANs and power outlets to student-owned laptops**
  - **Need to invest in specialised ICT laboratories**
- **Hire & develop a critical mass of ICT professionals** **(network engineers, systems administrators, programmers and effective helpdesk staff) to:**
  - **provide leadership of ICT at the corporate and ICT levels**
  - **support the students and faculty**
  - **support the automated systems and ERPs**
- **Spend 5-10% of total budget on ICT, with at least 1% of the total recurrent expenditure dedicated to Internet bandwidth**
  - **Student lab fees could support all recurrent ICT expenditures**
- **E-learning**
  - **Need for a national and institutional strategy on e-learning**
  - **Need to hire instructional designers and develop the capacity of faculty to develop e-learning materials**
  - **Top management to provide academic leadership on e-learning**

Q & A
Thank You
www.kenet.or.ke

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