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ANNUAL CORE DATA SURVEY REPORT (2022-2023)

Measuring Digital Inclusion and Readiness for Digital Transformation of Participating Member Institutions

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I take full responsibility for analysis, conclusions and recommendations contained in the 2022 annual core data report.

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Executive Summary

The data for the 2022 Annual Core Data Survey was collected from January to June 2023. It is called the 2022 Annual Core Data Survey because all the data used in the analysis was for the Fiscal Year (FY) and Academic Year (AY) 2021/2022. The FY for most of the participating member institutions was July 2021 to June 2023, while the AY was from September 2021 to August 2022. The sampling month for selecting the participating member institutions and measuring the community size was fixed as October 2022.

The survey used five different questionnaires for each of the six membership categories, namely, universities, tertiary colleges, research institutions, teaching hospitals, capacity building, and affiliate member institutions. Although the questionnaires were sent to all 208 members by October 2022, only 111 participated in the survey, out of which 92 were educational institutions. This 2022 Annual Core Data Report presents analyzed data for universities, tertiary colleges and teaching hospitals membership categories that had a participation rate of over 40% of the members. However, the data for all the 111 participating institutions is available for benchmarking.

The collection of annual core data tracks a subset of foundational e-readiness sub-indicators as part of monitoring and evaluation of KENET's strategic plan using a small set of foundational indicators. These indicators were derived from the e-readiness framework developed by KENET researchers in 2006 and were used for e-readiness surveys in the period 2006 – 2019 (see e-readiness portal at https://ereadiness.kenet.or.ke).

Table E1 below summarizes the indicators used for universities, tertiary colleges, and teaching hospitals for the 2021 and 2022 surveys. We highlight performance for indicators related to availability and affordability of internet (Indicators 1 – 4 in Table E2); degree of deployment ERPs and setting up of associated disaster recovery sites for business continuity and availability of critical ICT staff (indicators 6 – 8 in E1); sustainable financing of internet in educational institutions (Indicator 9); and compliance with Data Protection Act of 2019.

All participating institutions recorded an improvement in internet availability since the 2021 survey, but only the teaching hospitals achieved the KENET target of 100 Mb/s at 176 Mb/s per 1,000 users. Universities achieved internet bandwidth ratio of 52 Mb/s per 1,000 users compared to 40 Mb/s in 2021, and in tertiary colleges it increased to 15.5 Mb/s per 1,000 users compared to 10 Mb/s in 2021. While there was also an increase in the number of WiFi access points per 100 users in all the participating institutions, only teaching hospitals achieved the KENET target of two WiFi access points per 100 users.

Internet affordability measured by the percent annual internet expenditure to total annual recurrent expenditure increased marginally for all participating institutions. However, only participating tertiary colleges increased their internet expenditure per 1,000 users by 16% although the corresponding affordability ratio remained high at 1.75%, four times the KENET target of 0.4%. *It might therefore be necessary to subsidize internet services in tertiary colleges.*

Table E1: Summary annual core data results 2022 and 2021

Indicator	Universities		Tertiary colleges		Teaching hospitals	
	2022	2021	2022	2021	2022	2021
1. Internet bandwidth per 1,000 users	52.3	40.5	15.5	10.3	176.0	112.40
2. WiFi access points per 100 users.	0.7	0.6	0.3	0.1	4	5
3. Internet expenditure as a percentage of total recurrent expenditure	0.76%	0.8%	1.75%	1.9%	0.1%	0.2%
4. Internet expenditure per 1000 users.	1,020,338	1,101,576	509,288	437,641	2,934,143	3,340,176
5. Readiness for blended / online learning	98%	99%	63%	61%	N/A	N/A
6. Degree of deployment of administrative information systems (fully implemented ERPs)	57%	54%	55%	31%	33%	66%
7. Percent of institutions with fully-fledged disaster recovery sites	20%	21%	7%	3%	33%	33%
8. Availability of critical ICT staff (median number of critical staff per institution)	3	3	1	1	2	2
9. Total annual institutional internet expenditure as percentage of annual Student ICT lab fees	40%	31%	14.8%	Not Surveyed	N/A	N/A
10. Degree of compliance with the Data Protection Act of 2019	22.7%	Not surveyed	7.8%	Not surveyed	16.6%	Not surveyed

The degree of automation of participating institutions measured as percent of institutions that had completed deployment of ERPs had improved for universities and tertiary colleges according to the assessment of respective ICT directors or heads of ICT at 57% and 54% respectively. However, this is still a relatively low level of the self-reported degree of completion. In the case of hospitals, two of the four ICT directors changed their 2021 assessment of degree of completion in 2022, resulting in a drop from 66% to 33%. This suggests the need for a better measure of the degree of completion of automation for the statistically small number of participating institutions (e.g., only six hospitals participated). Thus, all participating institutions were encountering problems in full deployment of ERPs. Moreover, only a few of the participating institutions had set up full-fledged disaster recover sites at between 7% for tertiary colleges and 33% for teaching hospitals. In fact, 37 out of the 98 participating institutions reported that they were using the **free** public cloud storage for off-site backup. This suggests inadequate budget allocations for business continuity.

Table E1 shows that all participating institutions employed a few of the critical ICT staff (systems and network administrators) required to operate and secure campus networks and mission-critical information systems. For example, the median number of critical ICT staff in universities was only three. The median number in tertiary colleges was just one, with many of them having NO critical ICT staff. However, the data showed that ICT staff salaries expenditure was higher than annual internet expenditure. Moreover, over 50% of ICT staff were end-user support staff. This suggests that participating institutions could increase the number of critical ICT staff employed by simply reorganizing their annual ICT staff salary budgets.

Most of the participating universities were charging student lab fees (52 out 54 universities) while 10 of the 38 participating tertiary colleges were charging lab fees. Student ICT lab fees were supposed to be students' contribution towards sustaining ICT services. Table E2 shows that for the 52 universities, the annual internet expenditure was only 40% of the student ICT lab fees revenue. In the case of the 10 tertiary colleges, this was only 14.8% of the student lab fees. *This suggests that educational institutions could sustain recurrent and non-recurrent ICT expenditure using modest ICT lab fees of less than KES 4,000 per year (or about $30 per year per student).*

This report defines compliance with the Data Protection Act (DPA) of 2019 as registration as a data controller with Office of Data Protection Commissioner (ODPC). Table E2 shows very low levels of compliance in the range of 7.8% for tertiary colleges to 22.7% for universities. Only one of the six teaching hospitals had registered as a data controller by June 2023 (16.6%). This suggests that the senior leadership of the participating institutions had not prioritized compliance with the DPA of 2019.

This report highlights the following recommendations:

1. **Member institutions should recruit, retain and train enough critical ICT staff** (i.e., systems administrators and network administrators). For example, the 31 participating universities had a total annual ICT staff salaries expenditure of about **KES 745 million,** which is sufficient to employ an adequate number of critical staff (see Table 8.1). *It was therefore possible to reorganize the ICT staff expenditure to recruit more critical staff and other staff necessary to support digital transformation initiatives.*
2. **Senior leadership of member institutions should prioritize the implementation of ERPs with CEOs as the implementation champions.** We recommend selection of only a few ERP types and vendors to build an ERPs user group around each of the ERP types.
3. **Institutional leaders should prioritize business continuity by setting up fully-fledged disaster recovery sites**. This will protect institutions from any failures of mission-critical information systems that would disrupt the operations of institutions, or from threats of cybersecurity attacks.
4. **Educational institutions should aim to build sustainable, resilient, secure, and sovereign digital learning platforms** that are fully integrated with remote teaching and collaboration platforms and anti-plagiarism software. *Apart from using robust hardware and software platforms, educational institutions need to support local educational content development by hiring instructional designers and training faculty on content development and teaching with technology.*
5. **KENET member institutions and their respective CEOs should prioritize compliance with the Data Protection Act of 2019**. This involves developing a Data Protection Policy, a Data Privacy Policy, and registering as data controllers and/or data processors by December 2024.
6. **Educational institutions should aim to ring-fence annual student lab fees as one method of sustainably financing reliable and secure high-speed on-campus internet access to students and faculty and staff**. The student ICT lab revenues should be used to increase internet bandwidth capacity to the KENET target of *100 Mb/s per 1,000 users* and expand the on-campus WiFi coverage to a minimum of *two high-capacity WiFi access points per 100 users.*

Although this report is based on the survey of 98 participating institutions in the categories of universities, tertiary colleges, benchmarking data is available for all the 111 participating institutions. KENET continues to encourage all the members to participate in the annual core data survey for the benefit of the community and the beneficiary user.

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1. Introduction

The Annual Core Data Report series commenced in February 2020 and included analysis of core data collected in 2016 and 2018. However, the COVID-19 pandemic in March 2020 interrupted the 2019 and 2020 annual core data collection. Therefore, the 2021 Annual Core Data released in July 2022, covered 2019, 2020 and 2021. This Annual Core Data Report, based on 2022 data is the second report in the series.

The collection of annual core data was a requirement of the KENET Strategic Plan 2016–2021 and the current KENET Strategic Plan 2022–2027. The aim is to track a subset of foundational e-readiness sub-indicators defined in Section 2 of this report using only hard facts collected from all participating institutions. E-readiness survey is complex and expensive because it involves not only collecting hard facts from each participating institution but also perception data from a statistically significant sample of users at each participating institution (see e-readiness portal at https://ereadiness.kenet.or.ke). The annual core data survey is therefore a quick method for measuring a few key foundational ICT indicators based on hard facts.

As in the past, this annual core data report and the associated database of analyzed data aims to support the participating institutions in the following ways:

1. Provide participating institutions with data-based ICT indicators that could be used for monitoring and evaluation of the implementation of institutional ICT strategic plans.
2. ICT benchmarking with peer participating member institutions using all or a subset of the foundational indicators defined in this report.

In 2022, 111 out of 208 KENET member institutions participated in the annual core data survey, a participation rate of about 53%. In 2021, 108 institutions participated out of 181 members, a 59% participation rate. Fortunately, most of the 108 members that participated in 2021 also participated in 2022. The 2022 Annual Core Data Report analyzed data from three membership categories, namely, universities, tertiary colleges, and teaching hospitals (only universities and tertiary colleges were analyzed in 2021). These were the categories with a significant participation rate of 40% and above.

This report analyzed the following 10 core indicators:

1. **Internet bandwidth per 1000 users.** This is one of the sub-indicators of internet availability indicator in an institution or community in the e-readiness framework.

2. **WiFi access points per 100 users.** This is sub-indicator of internet availability on campuses or research stations or hospitals.
3. **Internet expenditure as a percent of the total institutional recurrent expenditure.** This is a sub-indicator of *ICT affordability* indicator in the e-readiness framework.
4. **Internet expenditure per 1000 users**. This indicator was introduced in the 2022 survey but is the second sub-indicator of *ICT affordability* indicator in the e-readiness framework.
5. **Degree of deployment of administrative information systems or ERPs**. This is one of the sub-indicators of the *e-campus* e-readiness indicator as measured by the extent of ERPs implementation according to the head of ICT. The summary measures only the percentage of participating institutions that had achieved full implementation.
6. **Readiness for adoption of blended/online learning** is measured by percent of participating institutions that have deployed institution-wide learning management systems.
7. **Mitigation of institutional business continuity risks** is measured using the availability of off-site backup or disaster recovery sites. This is one of the sub-indicators of the *networked campus environment* indicator.
8. **Availability of critical ICT human capacity** in an institution (i.e., network and systems administrators). This is a sub-indicator of *ICT Human Capacity* e-readiness indicator. It is measured by the median number of critical ICT staff in the membership category.
9. **Total annual institutional internet expenditure as percentage of annual student ICT lab fees.** This measures sustainable financing of internet bandwidth services in educational institutions.
10. **Degree of compliance with the Data Protection Act of 2019**. This is a new indicator and is based on percentage of members who had registered as data controllers with the Office of Data Protection Commissioner (ODPC).

The first two indicators measure the availability of internet for users while indicators 3 and 4 measure the affordability of internet bandwidth for the connected member institutions. The 2022 report has introduced a new indicator on the level of compliance with the Data Protection Act of 2019, measured by the percent of participating institutions that had registered as data controllers with ODPC.

The results show significant improvement in the Internet bandwidth per 1,000 users (also called Internet bandwidth ratio) for universities and tertiary colleges. For example, the tertiary college Internet bandwidth ratio increased from 10 Mb/s per 1,000 users to 15 Mb/s while for universities it increased from 40 Mb/s per

1,000 users to 55 Mb/s. However, this was still far below the KENET target ratio of 100 Mb/s per 1,000 users that was only achieved by the teaching hospitals.

Although most of the participating institutions had deployed ERPs, only 57% of universities, 55% of tertiary colleges and 33% of teaching hospitals reported that they had achieved over 80% implementation. This was the self-assessment of the ICT directors and suggests that many participating institutions were yet to complete implementation of their ERPs. Compliance with the Data Protection Act of 2019 was also very low at 7.5% for tertiary colleges, 16% for teaching hospitals, and 22.5% for universities.

The rest of this report is organized as follows: Section 2 describes the survey methodology used to collect the data and the subsequent data analysis. Section 3 presents the results of internet availability and internet affordability. Section 4 presents the results of the status of deployment of administrative information systems (ERPs). Section 5 covers the extent of adoption of blended and/or online learning in participating educational institutions. Section 6 examines the status of deployment of off-site backup or fully-fledged disaster recovery (DR) sites, and compliance with the Data Protection Act of 2019. Section 7 presents the results of ICT staffing and remuneration in member institutions. The report then addresses the important matter of sustainable financing of ICT services in educational institutions in Section 8. Finally, the conclusions and recommendations are contained in Section 9.

2. Annual core data indicators and methodology

2.1 Annual core data indicators

Annual core data indicators are a sub-set of the e-readiness survey sub-indicators. The e-readiness framework is based on 17 indicators and 60 sub-indicators grouped into five categories (see e-readiness portal https://ereadiness.kenet.or.ke/). The 17 e-readiness indicators aim to measure the potential of an institution or community to leverage ICT or digital technologies to achieve their mission. The indicators are staged on a scale of 1 – 4, with stage 4 as fully prepared and Stage 1 as unprepared.

E-readiness indicators and sub-indicators are derived from hard-facts collected from participating institutions and perception data collected from statistically significant number end-users at each participating institution. Data collection of statistically significant perception data is expensive. The annual core data was therefore supposed to be a simple method of measuring ICT readiness of member institutions.

The 2022 annual core data analysis is based on the following 10 foundational indicators:

1. **Internet bandwidth per 1000 users.** This is one of the sub-indicators of internet availability indicator in an institution or community in the e-readiness framework.
2. **WiFi access points per 100 users.** This is sub-indicator of internet availability on campuses or research stations or hospitals.
3. **Internet expenditure as a percent of the total institutional recurrent expenditure.** This is a sub-indicator of *ICT affordability* indicator in the e-readiness framework.
4. **Internet expenditure per 1000 users**. This indicator was introduced in the 2022 survey but is the second sub-indicator of *ICT affordability* indicator in the e-readiness framework.
5. **Degree of deployment of administrative information systems or ERPs**. This is one of the sub-indicators of the *e-campus* e-readiness indicator as measured by the extent of ERPs implementation according to the head of ICT. The summary measures only the percentage of participating institutions that had achieved full implementation.
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8. **Availability of critical ICT human capacity** in an institution (i.e., network and systems administrators) is a sub-indicator of *ICT Human Capacity* e-readiness indicator. It is measured by the median number of critical ICT staff in the membership category.
9. **Total annual institutional internet expenditure as percentage of annual student ICT lab fees.** This measures sustainable financing of internet bandwidth services in educational institutions.
10. **Degree of compliance with the Data Protection Act of 2019**. This is a new indicator and is based on percentage of members who had registered as data controllers with the Office of Data Protection Commissioner (ODPC).

Indicators 1 – 2 are measures of Internet availability and while Indicators 3-4 measure Internet affordability. Indicators 5 – 7 measure the degree of adoption of administrative information systems and blended learning platforms. The sustainability of ICT services is measured using Indicators 8 – 9. This report has introduced

Indicator 10, a new indicator to measure the degree of compliance with the Data Protection Act (DPA) of 2019.

In the following, we describe how the data was collected and analyzed.

2.2. 2022 Annual core data collection

KENET administered data collection questionnaires through the respective ICT directors or heads of ICT of member institutions. The questionnaires were tailored for each of the following six membership categories:

1. Universities – public and private universities, as well as university colleges;
2. Tertiary colleges – non-degree granting educational institutions including TVETs, TTCs, and medical colleges;
3. Teaching hospitals;
4. Capacity building institutions (e.g., CEMASTEA or School of Government);
5. Research institutes; and
6. Affiliate member institutions (i.e., affiliated to educational and/or educational institutions).

The use of six different questionnaires was to accommodate the diversity of KENET member institutions. For example, universities and tertiary colleges have large number of users, expansive campuses and a higher demand for internet bandwidth and WiFi coverage compared to other membership categories. The questionnaires administered are available for download at (https://ereadiness.kenet.or.ke/Questionnaire_for_2022_Annual_Core_Data). The CEOs of each participating institution was required to approve the data collection exercise and release of the completed questionnaires. KENET handled all the questionnaires and data with full confidentiality and in full compliance with the Data Protection Act of 2019.

2.3. Participating institutions in 2021 and 2022 surveys

The 2022 annual core data was collected from 111 out of the 208 member institutions. Table 2.1 shows that only universities, tertiary colleges, and teaching hospitals had a significant participation rate of over 40%. We especially observed the low participation of affiliate member institutions at 18% (i.e., only 4 out of the 22

affiliate members participated). The analysis for 2022 report was therefore only for the three categories of members.

Table 2.1: Participating member institutions annual core data survey in 2022

Membership category	# Members (October 2021)	Participating members (2021)	Percent participation (2021)	# Members (October 2022)	Participating members (2022)	Percent participation (2022)
Universities	**67**	**57**	**85%**	**68**	**54**	**79%**
Tertiary colleges	**61**	**36**	**59%**	**78**	**38**	**49%**
Research institutions	19	4	21%	20	6	30%
Teaching hospitals	**9**	**6**	**66%**	**9**	**6**	**66%**
Capacity Building Institutions	7	4	57%	11	3	27%
Affiliate member institutions	18	2	11%	22	4	18%
Total	**181**	**109**	**60%**	**208**	**111**	**53%**

Source: Annual core data 2022 and KENET

Although this report presents aggregate results for only three categories of members, the data for all the 111 participating institutions was analyzed and is available using the benchmarking tool.

3. Internet availability and affordability in participating institutions

3.1 Internet availability of participating institutions

The annual core data measures internet availability using two indicators, namely, internet bandwidth per 1,000 users and WiFi access points per 100 users. Both are sub-indicators in the e-readiness framework and from the hard facts data collected. Table 3.1 shows the staging for the two indicators according to the e-readiness staging framework. An institution in Stage 4 is considered fully prepared to leverage high-speed internet for digital transformation of teaching, learning, research, and administration of member institutions, while Stage

1 means it is unprepared for the digital transformation journey. All institutions should therefore aim to be in Stage 4 in both indicators.

Table 3.1: Staging of internet affordability indicators 2022

Internet bandwidth subscription (Mb/s) per 1,000 users	WiFi access points per 100 users	Stage
100 and above	4.0 and above	4.0
51 – 99.9	2.0 – 3.9	3.0
20 – 50	0.5 – 1.9	2.0
< 20	<0.5	1.0

In future, KENET shall also analyze data on networked computers per 100 users that are used in staff offices and in the shared computer labs in educational and capacity building institutions.

Table 3.2 shows the internet bandwidth per 1,000 users as well as the WiFi access points per 100 users for the three categories of members for 2021 and 2022. The six teaching hospitals achieved the highest ratio of 176 Mb/s per 1,000 users while the lowest ratio was for tertiary colleges at only 15.5 Mb/s. In all three categories, there was a significant improvement in the internet bandwidth per 1,000 users compared to the 2021 results. For example, there was an improvement of 29% and 50% for universities and tertiary colleges respectively. However, the ratio for tertiary colleges remained far below the target of 100 Mb/s per 1,000 users target partly due to inadequate allocation to internet budgets.

We note that teaching hospitals often provide internet access to students of medical schools as well as patients. In fact, KENET plans to extend eduroam WiFi to all teaching hospitals in the FY 2024/2025. The total number of users for teaching hospitals shall therefore be higher than the hospital staff and this will lower the internet bandwidth ratio.

Teaching hospitals also had the highest ratio of WiFi access points per 100 users of 4.0 compared to 0.7 for universities and 0.3 for tertiary colleges. This means that educational institutions will need to invest in campus WiFi to achieve the desired Stage 4 in WiFi coverage. However, the annual core data survey did not collect data on the distribution of the WiFi access points in the connected campuses. In general, each access point could support up to 100 concurrent connections.

Table 3.2: Trends in internet availability sub-indicators 2021 – 2022

Membership category	Total number of users		Internet bandwidth subscription per 1,000 users		WiFi access points per 100 users	
	2021	2022	2021	2022	2021	2022
Universities	668,004	669,935	40.5	52.3	0.6	0.7
TVETs	221,371	233,315	10.3	15.5	0.1	0.3
Hospitals	3,883	5,273	112	176	5	4
Total	**893,258**	**908,523**	**31.8**	**43.5**	**0.5**	**0.6**

3.2 Internet bandwidth affordability for participating institutions

The 2022 UN State of Broadband Report defines fixed broadband affordability in terms of the monthly cost of 5 GB data bundle at advertised download speeds of 256 kb/s as a percent of the GNI per capita. The target was set at 5 GB monthly data at less than 2% of the GNI per capita per month. However, this target is not meaningful for students who are not employed and whose typical monthly consumption of bandwidth might be higher than 5 GB based on anecdotal evidence gathered during the COVID-19 lockdown in 2020.

In response to the COVID-19 lockdown, KENET negotiated a special off-campus mobile internet bundle for students. This plan offered 10 GB of data per month for KES 500 (about USD 3). Anecdotal evidence suggests this price point made it an affordable option for students to support their online and blended learning needs. This was still about twice the average ICT/internet lab fees charged to students by educational institutions for access to unlimited on-campus internet bandwidth.

However, the annual core data does not measure affordability of internet for the end-users but only for the connected participating institutions. This is because KENET provides wholesale internet bandwidth to connected campuses. The institutions then distribute the internet to the end-users (i.e., staff, faculty, students or patients). KENET therefore adopted the e-readiness Internet affordability indicator measured using two sub-indicators, namely, annual internet expenditure as a percent of the total annual recurrent expenditure and annual internet bandwidth expenditure per 1,000 users. The e-readiness framework staging of the two indicators is shown in Table 3.3. These are the two annual core data indicators of affordability in the annual core data analysis.

Table 3.3: Staging of internet affordability sub-indicators

Annual internet expenditure ratio - % of annual internet expenditure to total expenditure	Annual internet expenditure per 1,000 users (KES)	Stage
< 0.4%	>3.00 M	4.0
0.4 – 0.99%	2.00 - 2.99 M	3.0
1.0 – 1.99%	1.00 - 1.99 M	2.0
2 and higher	<1.00 M	1.0

Table 3.4 shows the annual internet bandwidth expenditure as a percentage of the total recurrent expenditure for the three membership categories of participating institutions in 2021 and 2022, indicating a marginal change in the ratio for all the three categories. This means there was no significant change in internet bandwidth budget. Teaching hospitals were in Stage 4 of this indicator while tertiary colleges were in Stage 2 and universities in Stage 3 according to the Table 3.3 staging framework.

Table 3.2 also shows that the internet bandwidth expenditure per 1,000 users dropped slightly in 2022 for universities and teaching hospitals category of participating member institutions. Since the annual subscription had increased, it means there was a drop in the weighted unit price of internet bandwidth. The tertiary college expenditure per 1,000 users increased. Table 3.2 therefore shows that affordability did not change significantly. One possible reason is that internet prices were in the lower bands of less than 100 Mb/s.

Tertiary colleges did not perform well in the internet affordability indicators and were in lower stages of readiness according to the staging framework shown in Table 3.3. For example, the total internet expenditure per 1,000 students was about 50% for universities. Teaching hospitals were spending close to 3 times per 1,000 users compared to universities. Thus, educational institutions need to increase their internet budgets to achieve higher stages of readiness.

Table 3.4: Trends in internet affordability indicators 2021 – 2022

Membership category	Total number of users		% of annual internet expenditure to total recurrent expenditure		Internet bandwidth expenditure per 1,000 users (KES)	
	2021	2022	2021	2022	2021	2022
Universities	668,004	669,935	0.8%	0.76%	1,101,576.62	1,020,338.43
Tertiary colleges	221,371	233,315	1.9%	1.75%	437,641.54	509,288.21
Teaching hospitals	3,883	5,273	0.2%	0.1%	3,340,176.71	2,934,143.97
Total	**893,258**	**908,523**	**0.85%**	**0.72%**	**946,768.62**	**900,204.78**

4. Deployment of administrative information systems in member institutions

The annual core data collected was used to assess the extent of deployment of both administrative and academic information systems. The administrative information systems include general ERPs or specialized systems such as student management information systems in educational institutions, or health management information systems in teaching hospitals, that support the operations of the member institutions. The degree of deployment of administrative information systems is an indirect measure of the readiness of member institutions for the digital transformation (or Dx) journey.

While the deployment of administrative information systems improves institutional management, it also exposes institutional ICT risks including loss of critical data and cybersecurity attacks. These are often mitigated by setting up disaster recovery sites, providing clean power, and employment of competent and motivated ICT staff in areas of accounting information systems, systems administration, and cybersecurity.

In the following sub-sections, we summarize the results for the participating universities, tertiary colleges, and teaching hospitals.

4.1 Status of deployment of administrative information systems (ERPs)

Table 4.1 shows the degree of deployment of administrative information systems (ERPs) as measured by the participating institutions that had operational ERPs and those that had achieved above 80% in extent of implementation. The extent of implementation of ERPs was based on perception survey of the respective ICT directors or heads of ICT.

The results show that whereas 53 of the 54 participating universities had deployed ERPs, only 31 reported to have achieved over 80% implementation. The results also show that 27 of the 38 participating tertiary colleges had deployed an ERP, but only 21 of the 27 had reached an implementation level exceeding 80%.

This was an improvement over the 2021 survey that indicated that only 11 of 36 tertiary colleges had achieved over 80% implementation. We note that only 11 of the 38 participating tertiary colleges did not have any ERP in 2022. All the teaching hospitals had deployed ERPs but only two of six hospitals had achieved above 80% implementation.

Table 4.1: Deployment of ERPs in 2021 – 2022

Membership category	**Members providing data**		**# of members with an operational ERP**		**# of institutions at 81% and above ERP in extent of implementation**	
Year	**2021**	**2022**	**2021**	**2022**	**2021**	**2022**
Universities	57	54	56	53	31	31
Tertiary colleges	36	38	25	27	11	21
Teaching hospitals	6	6	6	6	4	2

Source: Annual core data 2021- 2022

Table 4.2 shows the different stages of implementation for participating institutions according to the self-assessment of ICT directors or heads of ICT. Note that this was a perception survey, and no data was collected to measure the actual extent of implementation. However, we still consider this to be an important indicator of the degree of full implementation of the ERPs. For example, only two ICT directors reported that hospitals had achieved over 80% implementation in 2022 compared to four in 2021. This is because two of the ICT

directors changed their self-assessment. Future surveys will update hard-facts questionnaires to measure the degree of implementation.

Table 4.2: Extent of ERP/administrative information system implementation in 2021 and 2022

Category	81%-100%		61%-80%		41%-60%		>40%		Do not know or NO ERP		Total	
	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021	2022	2021
Universities	31	31	17	21	2	4	3	0	1	1	54	57
TVETs	21	11	6	8	0	6	0	5	11	6	38	36
Hospitals	2	4	3	2	0	0	1	0	0	0	6	6
Total	**54**	**46**	**26**	**31**	**4**	**10**	**6**	**5**	**8**	**7**	**98**	**99**

4.2 Hosting locations for ERPs

The annual core data in 2022 surveyed the hosting locations for ERPs or administrative systems for the three categories of participating institutions. Table 4.3 summarizes the results showing that only seven of the 87 institutions with operational ERPs were hosting their ERPs off-site in the public or community cloud. This suggests that participating institutions in the three categories of membership were not yet ready to move their ERPs to the public or community cloud. None of the six teaching hospitals were hosting their ERPs in the public or community cloud.

Table 4.3: Hosting location of the primary ERP

Membership category	Members providing data		# of members with an operational ERP		# of hosting ERP server room		# hosting ERP in public/community cloud	
Year	**2021**	**2022**	**2021**	**2022**	**2021**	**2022**	**2021**	**2022**
Universities	57	54	56	53	48	47	5	3
Tertiary colleges	36	38	25	27	17	23	6	4
Teaching hospitals	6	6	6	6	6	6	0	0
Total	**99**	**98**	**87**	**92**	**71**	**75**	**11**	**7**

4.3 ERP products deployed by participating institutions.

The annual core data survey included questions on the ERP products deployed by the participating institutions. This was aimed at establishing support user groups for institutions that had deployed the same ERP product. In the following, we analyze the results for each of the three categories of members, namely, universities, tertiary colleges, and teaching hospitals.

4.3.1 ERPs types deployed by universities.

Table 4.4 shows that Microsoft Dynamics/Navision were the preferred ERP products in universities (19 of the 51 universities). The ERP developed by a local developer ABNO Unisol was the second most preferred ERP among universities (15 of the 53 universities). Three private universities had deployed big brand ERPs such as Jenzabar, Campus Nexus, and Oracle, while one public university had deployed a locally developed fully-fledged ERP. There were 13 of the 54 participating universities that had deployed financial information systems (e.g., Sage Pastel) rather than fully-fledged educational ERPs. Such universities will need to migrate to full-fledged ERPs in the future. One university college without an ERP was still using the ERP of the parent university.

Thus, it could be considered that all the 54 participating universities had deployed ERPs in 2022. *Universities that deployed either Microsoft Dynamics or ABNO could form a local community of users.*

Table 4.4: Types of ERPs used in the universities 2021 – 2022

Name of ERP	**Types ERP deployed in universities**	**Types ERP deployed in universities**
	2021	**2022**
Microsoft Dynamic/Navision	19	19
ABNO Unisol	14	15
Other types of ERPs (e.g., Jenzabar and Campus Nexus, UNIPLUS, Sage Pastel)	22	18
None	2	2
Total	**57**	**54**

4.3.2 ERPs types deployed by participating tertiary colleges

Among the tertiary college category of participating members, Table 4.5 shows that the dominant ERP product was the one locally developed by ABNO UNISOL. This was deployed by 11 of the 33 tertiary colleges with an ERP. There were other ERP types that were deployed by another eight tertiary colleges. However, there were five of the 38 participating tertiary colleges that had not deployed any ERP. This was an improvement because in 2021, 13 of the 36 participating tertiary colleges had not deployed an ERP.

KENET shall continue to focus on addressing both technical and leadership barriers to ERP deployment in the FY 2023/2024 through forums and technical advisory services.

Table 4.5: Types of ERPs used in the tertiary colleges 2021 – 2022

Name of ERP	**Types ERP deployed in tertiary colleges**	
	2021	**2022**
Microsoft Dynamics Navision	2	2
ABNO Unisol	14	11
Ultimate ERP	6	3
Other types of ERPs	4	8
None	10	11
Did not answer	0	3
Total	**36**	**38**

4.3.3 ERPs types deployed by teaching hospitals.

As of October 2022, there were 10 teaching hospitals that were members of KENET. Although only six of the 10 participated in the 2022 survey, KENET had data on the ERP types and vendors for the hospitals. Two of the 10 had developed an in-house ERPs while two had deployed the Microsoft Navision-based solutions.

It was clear teaching hospitals had deployed different types of ERPs without a common vendor or product as was the case with educational institutions. However, it is possible that teaching hospitals have common problems in the implementation, upgrade and support of Hospital Management Information System (HMIS).

KENET shall therefore initiate the formation of a Working Group on HMIS for the teaching hospitals' ICT community.

4.4 Conclusions on ERP degree of deployment and ERP types

The 2022 survey results show that there was an emerging community of universities that had deployed ERPs based on the Microsoft Dynamics products, most of them being old Navision products. The universities were supported by different Microsoft integration partners. It is possible to form a user group on Microsoft ERP users that could enhance support and implementation of the ERP products.

At the tertiary college level, 11 of the 38 participating tertiary colleges had not yet selected an ERP type or vendor. This community could be encouraged to adopt one of the ERP types widely deployed in educational institutions.

The lack of a common dominant ERP for teaching hospitals is a problem for local support. However, many of the systems are based on a few of the dominant database systems (e.g., Oracle or Microsoft) and that could be the basis for forming a local user group for ERPs in hospitals.

Overall, only 55% of participating institutions reported achieving implementation levels above 80%. This suggests a low percentage achieved the minimum level of readiness for the digital transformation journey.

5. Adoption and deployment of virtual teaching, learning and collaboration platforms.

KENET members often use different software platforms to support remote teaching and webinars; blended and/or online learning; and virtual collaboration and meetings. There was an increased adoption of blended and online learning modalities and remote working practices after the outbreak of COVID-19 pandemic in 2020. The following are some of the main categories of software platforms used or deployed by the participating member institutions:

1. **Remote teaching and webinars platforms** – members were using cloud-based open source or commercial web conferencing platforms, often offered as Sofware as a Service (SaaS). In the KENET community, this includes KENET web conferencing platform based on BigBlueButton open-source software and available to members as a **free** service; while Zoom, Google Meet or Microsoft Teams are also available on a subscription basis.

2. **Blended and online learning platforms** – these are basically Learning Management Systems (LMS), often integrated with one or more of the remote teaching or web conferencing platforms. The common LMS used were Moodle LMS, Canvas, or Blackboard among others.
3. **Virtual collaboration and meetings platforms** – these platforms often use the same software platform as the remote teaching platform. The KENET community was using the KENET web conferencing, Microsoft Teams, Google Meet or Zoom

The survey aimed to establish the specific dominant platforms used by member institutions for each of the above categories. This could be the basis for constituting a users' group to negotiate lower prices or for faculty capacity building. In the following, we present results for the three membership categories analyzed in this report.

5.1 Remote teaching and webinars platform

Table 5.1 shows the different remote teaching and webinars platforms used by universities and tertiary colleges. Data for the teaching hospitals was not analyzed although many hospitals still require a webinar platform. Note that institutions use multiple platforms (e.g., Zoom and Google Meet).

The results show that Zoom was used in 36 of the 54 universities and in 22 of the 38 tertiary colleges. The **free** KENET web conferencing platform was used by 33 of the 54 universities, and 13 of the 38 tertiary colleges. These were the two widely used platforms for remote teaching and webinars.

We observe the increased adoption of KENET web conferencing platform by tertiary colleges as one of the remote teaching platforms from five institutions in 2021 to 13 in 2022. Google Meet and Microsoft Teams were the other remote teaching tools used by educational institutions.

Since the annual core data does not collect perception data, it was not possible to establish which one was the preferred remote teaching platform for faculty.

Table 5.1: Remote teaching platforms 2021 – 2022

Remote teaching /Webinar platform	# of institutions			
	Universities		Tertiary colleges	
	2021	2022	2021	2022
Zoom	38	36	24	22
KENET Web conferencing platform	34	33	5	13
Google Meet	12	17	16	18
Microsoft Teams	10	10	10	18
Webex	1	2	1	2

5.2 Blended and online learning systems

Learning Management Systems (LMS) are critical for supporting blended and online learning modalities. At the onset of COVID-19 pandemic in March 2020, the government closed all educational institutions. Educational institutions that had operational LMS transitioned immediately from in-person learning to emergency remote teaching and online learning. Other institutions upgraded their LMS setup to support the large number of students taking blended and/or online classes. KENET offered technical support in developing guidelines on resource requirements based on student population, technical expertise in the installation of Moodle LMS and hosting of the MLM on the KENET community cloud.

The 2022 survey was therefore an indirect assessment of adoption two years after the end of the COVID-19 pandemic. The results could also measure the transition from the emergency remote teaching with some LMS content to fully-fledged blended learning modality. The results also show the preferred LMS and hosting locations (on-premises or community cloud or public cloud).

Table 5.2 below shows that that the dominant LMS for Kenyan educational institutions was Moodle, an open source LMS, that was deployed in 49 of the 54 participating universities and 18 of the 38 participating tertiary colleges. Only seven educational institutions were using other LMS types (e.g, CANVAS, Sakai or Blackboard). *We also note that 17 of the 38 participating tertiary colleges did not have an operational LMS*. This means almost 50% of the tertiary colleges were not yet ready to adopt blended and/or online learning modalities.

Overall, universities were in higher levels of readiness for adoption of blended/online learning in terms of deployment of LMS and remote teaching platforms. However, no data was collected on the number of courses digitalized at university level or tertiary level or the degree of adoption of blended and/or online learning practices by the institutions. This will be part of a future comprehensive e-readiness survey of universities and tertiary colleges.

Table 5.2: Learning Management Systems in 2021 – 2022

Category	**Moodle**		**Blackboard**		**Other (Sakai, Google Classroom, Open LMS, Mzizi, etc.)**		**None**	
	2021	**2022**	**2021**	**2022**	**2021**	**2022**	**2021**	**2022**
Universities	50	49	1	1	8	4	1	1
Tertiary Colleges	18	18	0	0	4	3	14	17
Overall	**68**	**67**	**1**	**1**	**12**	**7**	**15**	**18**

5.3 Virtual collaboration platform

All KENET members subscribe to or have access to virtual collaboration and virtual meetings platforms. This is because of the increased adoption of remote working practices and the need for global research collaboration. Table 5.3 shows the platforms used for virtual collaboration that includes meetings, webinars, forums, and conferences that now includes teaching hospitals.

The results show that the two top virtual collaboration platforms were Zoom and KENET web conferencing platform. We note that none of the teaching hospitals were using the KENET web conferencing platform that was free for member institutions. This was probably because the KENET system was promoted as primarily a remote teaching platform.

Table 5.3: Virtual collaboration platform 2021 – 2022

Webinar platform	Universities		Tertiary colleges		Teaching hospitals	
	2021	2022	2021	2022	2021	2022
Zoom	38	36	24	22	5	5
KENET web conferencing platform	34	33	5	13	0	0
Google Meet	12	17	16	18	0	0
Microsoft Teams	10	10	10	18	2	2
Webex	1	2	1	2	0	3

5.4 Hosting locations of learning management systems and institutional repositories

Universities and tertiary colleges often need to setup Learning Management Systems (LMS) to support blended or online learning. In some cases, these LMS are integrated with a remote teaching platform to create what is called a *digital learning platform*. The LMS could be hosted on premises in the server rooms or data centers of educational institutions, or in the community or public cloud.

Table 5.4 shows that 30 of the 54 participating universities hosted their LMS in the public or KENET community cloud, while 19 hosted it in the institutional servers. In tertiary colleges, 12 out of 38 hosted their LMS in the public or KENET community cloud, with none choosing on-premises hosting. This contrasts with the ERPs which are mainly hosted in the institutional server rooms as shown in Table 4.3 in Section 4.

Table 5.4 shows that 55 of the 92 participating universities and tertiary colleges had set up institutional repositories. Interestingly, 47 of the 55 repositories were hosted in the institutional server rooms. *It was not clear why most of the LMS were hosted in the public/community cloud while institutional repositories were hosted in the institutional server rooms*. We note that only four of the 38 participating tertiary colleges had set up institutional repositories. This is expected because of the limited research focus on tertiary colleges.

Table 5.4: Hosting locations for LMS and repositories 2022

	Institution server room		Public/Community cloud		
	Universities	**TVETs**	**Universities**	**TVETs**	**Total**
LMS	19	9	30	12	70
Repositories	44	3	7	1	55

6. Status of deployment of off-site back and disaster recovery sites and compliance with Data Protection act of 2019

6.1. Context

The main purpose of off-site backup or disaster recovery (DR) is to safeguard business continuity of an institution when critical primary information systems become unavailable, due to factors such as power failure, hardware or software failure, fire, or successful cybersecurity attacks. Institutions mitigate against such risks by setting up off-site backup sites or fully-fledged disaster recovery sites.

The location of a fully-fledged DR site must be in a secure geographical location to reduce the risk of both primary and backup systems being affected by the same disaster. The options for DR sites and setups include leased community cloud backup or collocated DR sites at a data center. In case of limited budgets, institutions could consider off-site backup of critical data that includes blended learning content. Setting up off-site backup or DR sites requires competent ICT staff.

In a fully-fledged disaster recovery setup, the unavailability of the primary site means that institutions can operate from the secondary disaster recovery site seamlessly. Institutions unable to set up fully-fledged disaster recovery systems need at least to set up off-site backup for critical ERP data or LMS content to ensure full recovery from failure or unavailability. Critical ICT staff need comprehensive training on the DR plan, to understand their roles and responsibilities in case of an emergency.

In 2022, the survey also included questions to assess the degree of compliance with the Data Protection Act of 2019. This included questions on the availability of data protection and data privacy policies as well as registration as data controllers with the office of data protection commissioner (ODPC).

6.2 Status of off-site backup and disaster recovery sites in 2022

Table 6.1 shows the number of participating institutions that had set up off-site backup or fully-fledged DR sites in 2021 and 2022. For example, in 2022 only 11 of the 54 participating universities had set up operational fully fledged disaster recovery sites while 34 had an off-site backup only. *We note that 10 of the 54 universities indicated they had not yet set up any off-site backup or DR sites.*

In the case of tertiary colleges, only three out of the 38 had a fully-fledged DR site while 10 had an off-site backup for some ERP data as of October 2022. This means that 18 of the 38 participating tertiary colleges had NO off-site backup or DR sites. This includes the 11 tertiary colleges that did not have any ERP (see Table 4.4). *This is an indication of a low level of readiness for the digital transformation journey of tertiary colleges when compared to universities.*

Unlike educational institutions, all the six teaching hospitals had either an operational off-site backup for critical data or a full-fledged DR site. Specifically, four out of six participating teaching hospitals had a fully-fledged DR site.

Table 6.1: Status of off-site backup and disaster recovery sites 2021 – 2022

Membership category	**Members providing data**		**# of members with off-site backup (2021–2022)**		**# with fully-fledged disaster recovery site (2021–2022)**		**# of institutions without DR or off-site backup (2021–2022)**	
Annual core data year	2021	2022	2021	2022	2021	2022	2021	2022
Universities	57	54	32	34	12	11	12	10
Tertiary colleges	34	38	8	10	1	3	17	19
Teaching hospitals	5	6	3	5	2	2	0	0
Overall	96	98	43	49	15	16	29	29

6.3 Location of off-site and disaster recovery sites

The physical location of both DR sites and off-sites backup matters for several reasons, including compliance with the Kenya Data Protection Act (DPA) of 2019 and mitigation of business continuity risks. DPA of 2019 requires all personal data to be hosted in Kenya or in a country with equivalent data protection laws. Mitigation

of business continuity risks often requires that the DR or off-site backup sites are in a geographically different location. Table 6.2 shows that in 2022, 21 of the DR or off-site backup sites of participating universities, tertiary colleges and teaching hospitals were hosted in the KENET community data centers while 32 were at a different location from the primary institutional data center of the same institution. We note that 15 DR or off-site backup sites were hosted in an external public cloud.

Thus, close to 50% (27 out of 70) of the offsite or DR centers were hosted at different locations of the institutions. This is probably an attempt to save on the cost of collocation or leased virtual servers. We note that this is not a good practice except for cases where the DR or backup sites are in different geographical locations (e.g., a different campus of a university in a different geographical location).

Table 6.2: Location of off-site or disaster recovery sites

Category	**Different location of the institution**		**KENET data center**		**External public cloud**	
	2021	2022	2021	2022	2021	2022
Universities	15	17	20	17	11	9
TVETs	9	11	3	3	6	5
Hospitals	3	4	2	1	1	1
Total	**27**	**32**	**25**	**21**	**18**	**15**

Table 6.3 shows that there was increased use of off-site backup in FREE public cloud storage (e.g., Dropbox or Google Drive). The use of off-site free storage increased from 19 of 96 participating institutions in 2021 report to 37 of the 98 participating institutions in 2022. This suggests that member institutions were not allocating budget for off-site backup or DR sites.

*Table 6.3: Off-site backup in **free** public cloud storage*

Membership category	**Free offsite storage (e.g., Google Drive or Dropbox)**	
Year	2021	2022
Universities	8	24
Tertiary colleges	10	12
Teaching hospitals	1	1
Total	**19**	**37**

Table 6.4 shows that 10 of the 54 participating universities did not have a disaster recovery plan while 19 of the 38 participating tertiary colleges did not have a DR plan. This could partly explain the high usage of **free** public cloud off-site back storage by educational institutions. *We note that all six participating teaching hospitals had a DR plan. KENET shall therefore promote the development of DR plans in member educational institutions in FY 2024/2025 through capacity building and awareness workshops for the senior leadership.*

Table 6.4: Status of disaster recovery plan

Category	**Yes**	**No**	**Total**
Universities	44	10	54
TVETs	18	20	37
Hospitals	6	0	6
Total	**68**	**29**	97

6.4 Compliance with Data Protection Act of 2019

The 2022 survey included questions on compliance with the Data Protection Act of 2019 for the first time. Table 6.5 shows that 30 of the 54 participating universities did not have a data protection policy, a requirement for registration with the Office of Data Protection Commissioner (ODPC). It also shows that five of the six teaching hospitals did not have a data protection policy. Similarly, 28 of the 38 participating tertiary colleges did not have an approved data protection policy.

Table 6.5 shows that only 16 out of the 98 participating institutions indicated that they had registered as data controllers with the Office of Data Protection Commissioner (ODPC). ***These are the only institutions that could be considered compliant with the DPA of 2019.*** This is therefore a very low level of compliance at only 16%. Surprisingly, only one of the six teaching hospitals had registered as a data controller.

Table 6.5: Status of institutional data protection and privacy protection policies 2022

Category	**Data protection policy**		**Privacy protection policy**		**Institution registered as data controller with the Office of the Data Protection Commissioner?**	
	Yes	**No**	**Yes**	**No**	Yes	No
Universities	23	30	18	34	12	34
TVETs	4	28	8	24	3	30
Hospitals	1	5	2	4	1	4
Total	**28**	**63**	**28**	**62**	**16**	**68**

We note that the self-reported compliance level was high as shown in Table 6.6, with 54 of the 98 participating institutions reporting compliance with DPA of 2019. There were also 12 institutions that did not respond to the question of compliance, probably because they did not know the answer. KENET shall therefore support institutions that need to register or develop data protection policies necessary for registration through templates and capacity building workshops.

Table 6.6: Self-reporting compliance with Data Protection Act of 2019

Category	**# of institutions reporting compliance**		
	Yes	No	No answer
Universities	33	15	6
TVETs	17	15	6
Hospitals	4	2	0
Total	**54**	**32**	**12**

7. ICT staffing and remuneration 2021-2022

7.1. Background

The efficient operation of campus networks and institutional information systems requires skilled network and systems administrators and/or engineers. These critical ICT staff ensure that ICT systems are operational on a 24/7 basis. They also ensure that campus networks and information systems remain secure by setting up and administering firewalls, off-site backup, or fully-fledged disaster recovery sites.

These critical ICT staff should be available in adequate numbers for the different sizes of institutions. *The challenge for KENET member institutions, and particularly educational institutions, is to attract and retain competent critical ICT staff that are also in high demand in the private industry.* Although KENET member institutions must aim to pay competitive salaries, it is even more important to enhance their working environments including providing challenging assignments, regular specialized training, and creating an appropriate ICT talent pipeline.

In addition to the critical backend ICT staff, there is a need for well-trained end-user support ICT staff. In the large educational institutions or capacity building institutions that have adopted blended or online learning

modalities, it is also necessary to recruit competent instructional designers to support trainers/faculty in developing engaging educational content.

In the following sections, we analyze the ICT staffing levels and remuneration in the participating universities, tertiary colleges, and teaching hospitals.

7.2 ICT staffing levels in participating universities, tertiary colleges, and teaching hospitals

Table 7.1 shows the derived ICT staff indicators for 2021 and 2022 annual core data surveys. There were 1,194 ICT staff employed in the 98 participating institutions. About 72% (858) of the ICT staff were employed by universities. This was expected because of the large number of users. However, tertiary colleges with an average of seven ICT staff members per college was low compared to the average of 16 ICT staff per university. Hospitals employed an average of 11 ICT staff per hospital, a relatively small number considering the high level of automation of the six hospitals.

Table 7.1: ICT staff 2021 – 2022

Category of member institution	**Number of members providing data**		**Total users (Oct 2021 - Oct 2022)**		**ICT staff numbers**		**Median ICT network+ systems admins staff per institution**	
Annual core data year	**2021**	**2022**	**2021**	**2022**	**2021**	**2022**	**2021**	**2022**
Universities	57	54	627,926	669,935	754	858	3	3
Tertiary colleges	36	38	171,719	233,315	186	265	1	1
Teaching hospitals	5	6	3,883	6,351	66	71	2	2
Overall	**98**	**101**	**803,528**	**909,601**	**1,006**	**1,194**	**6**	**6**

Although the average number of ICT staff per participating institution seemed satisfactory, the number of critical ICT staff was inadequate. For example, the median number of critical staff was only three for universities, one for tertiary colleges and two for teaching hospitals. In fact, there were tertiary colleges that did not have any critical ICT staff. We note that the number of critical ICT staff for all the participating institutions was inadequate. As a start, we recommend doubling the median number for each of the membership categories (i.e., six for universities, two for tertiary colleges and four for teaching hospitals).

Table 7.2 shows the different ICT staff categories employed in the participating institutions. We note that of the 1,199 ICT staff in 2022, about 50% were simply end-user ICT staff. The critical ICT staff (systems administrators/network administrators) constituted about 20% of the ICT staff.

Table 7.2: ICT staff numbers in 2021 – 2022

Annual core data year	**2021**				**2022**			
Category of institution	**Universities**	**Tertiary colleges**	**Teaching hospitals**	**Overall**	**Universities**	**Tertiary colleges**	**Teaching hospitals**	**Overall**
ICT network+ systems admins	175	46	13	221	195	47	17	259
Application developers	109	11	10	120	86	22	10	118
Webmasters	New	New	New	New	60	18	1	78
Instructional designers	New	New	New	New	31	26	1	57
End-user support	371	63	23	434	384	97	29	510
Others (e.g., casuals, interns)	99	66	20	165	102	62	13	177
Total	**754**	**186**	**66**	**940**	**858**	**272**	**71**	**1199**

Table 7.3 shows that only 41 out of 98 participating institutions (or 41%) indicated that they had a staff training budget. While teaching hospitals had a training budget (5 out of 6), only 14 of the 38 tertiary colleges had a training budget. Even at university levels, only 40% had a training budget (22 of the 54 universities). *We recommend that all member institutions allocate an adequate training budgets for ICT staff based on the requirements of each institution.*

Table 7.3: Availability of training budgets

Category	**Budget for ICT staff training**			
	2021	**2022**	**2021**	**2022**
	Yes	Yes	No	No
Universities	32	22	23	32
Tertiary colleges	20	14	14	24
Teaching hospitals	Not surveyed	5	Not surveyed	1
Overall	**52**	**41**	**37**	**57**

7.3 ICT staff salary bands

Salary bands for ICT (Information and Communication Technology) staff vary based on factors such as experience, qualifications, location, and the specific role within the ICT domain. These salary bands are often categorized into different levels or tiers to ensure that compensation aligns with an employee's skills, responsibilities, and contributions to the organization. Salaries within these bands can be further influenced

by factors such as geographic location (e.g., urban areas typically offer higher salaries), industry (e.g., finance, healthcare, technology), and the size and financial health of the employing organization.

Salary bands for ICT must be benchmarked by industry ICT staff salaries to attract and retain critical ICT staff. One of the annual core data survey's objectives is to provide members with benchmarking services in different areas including ICT staff salaries. This will be available to participating institutions from July 2024. As an example, Table 7.4 shows the salary bands for critical staff for the participating universities that were analyzed for this report. We note the wide range of bands with some universities with a minimum entry level salary of KES 35,000 for a systems administrator while the highest entry level salary was KES 196,853 for the same position. Similarly, the highest upper band was KES 257,240 for the systems administrator while the lowest upper band was KES 45,000.

There was also a wide range of entry level salaries for the heads of ICT (or ICT director) with the minimum being KES 70,222 and the highest lower band being KES 431,100. The minimum upper band for ICT directors was KES 84,110 while the highest upper band was KES 669,100.

Tables 7.5 and 7.6 present similar analysis for tertiary colleges and teaching hospitals. In general, teaching hospitals were paying higher salaries for their critical ICT staff while tertiary colleges were paying very low salaries. The KENET benchmarking tool will allow participating institutions to compare their salaries with peer institutions.

Table 7.4: ICT staff salary bands 2022 for universities

Category of ICT Staff	Universities			
	2022		2022	
	Entry level salary band		Highest salary band	
	Min	Max	Min	Max
Systems administrators	35,000.00	196,853.00	45,000.00	257,240.00
Network administrators	20,000.00	177,333.00	40,000.00	257,240.00
Application developers	30,225.00	177,333.00	52,552.00	331,544.00
Webmasters	29,464.00	177,333.00	12,524.00	257,240.00
Instructional designers	38,873.00	192,100.00	50,470.00	338,700.00
Director ICT	70,222.00	431,100.00	84,110.00	669,100.00

Table 7.5: ICT staff salary bands 2022 for tertiary colleges

Category of ICT Staff	Tertiary colleges			
	2022		2022	
	Entry level salary band		Highest salary band	
	Min	Max	Min	Max
Systems administrators	18,000.00	130,000.00	21,000.00	268,000.00
Network administrators	18,000.00	96,000.00	22,000.00	180,000.00
Application developers	18,000.00	96,000.00	22,000.00	180,000.00
Webmasters	27,000.00	70,000.00	35,000.00	180,000.00
Instructional designers	45,000.00	70,000.00	95,000.00	180,000.00
Director ICT	20,000.00	180,000.00	30,000.00	350,000.00

Table 7.6: ICT staff salary bands for teaching hospitals

Category of ICT Staff	Teaching hospitals			
	2022		2022	
	Entry level salary band		Highest salary band	
	Minimum	Maximum	Min	Max
Systems administrators	44,000.00	105,500.00	44,000.00	280,000.00
Network administrators	40,000.00	109,500.00	44,000.00	150,000.00
Application developers	57,000.00	80,000.00	57,000.00	300,000.00
Webmasters	45,770.00	45,770.00	45,770.00	45,770.00
Director ICT	160,000.00	280,600.00	160,000.00	754,715.00

Table 7.7 summarizes the average range of salaries for selected ICT staff salaries in educational institutions. It shows that on average, universities' ICT staff salaries were two times those of tertiary colleges. Unfortunately, no data on the qualifications and experience of the critical ICT staff was collected. However, the wide difference between the salaries of universities ICT staff and those in tertiary colleges suggests the very different qualifications and experience of the ICT staff. Anecdotal evidence suggests that institutions that have achieved higher levels of digitalization pay higher salaries (e.g., teaching hospitals and universities). *This will be analyzed in future annual core data reports.*

Table 7.7: Average salary bands for selected ICT staff participating in universities and tertiary colleges

Category of ICT Staff	Universities		Tertiary Colleges	
	Lowest (Average)	Highest (Average)	Lowest (Average)	Highest (Average)
Systems Administrators	88,942.90	134,178.54	49,973.08	79,756.73
Network Administrators	79,369.98	126,357.86	44,811.33	70,284.82
Application Developers	85,206.26	130,104.06	53,800.00	86,850.00
Webmasters	83,820.38	118,037.95	46,750.00	85,250.00
Instructional Designers	87,166.25	139,977.59	57,500.00	137,500.00
Director ICT	189,487.32	259,694.95	76,762.67	113,104.00

8. Sustainable Financing Internet and ICT services

8.1. Sources of ICT funding in educational institutions

One of the indicators of e-readiness is ICT financing. This is measured by two sub-indicators, namely, annual ICT expenditure as a percentage of total expenditure and the annual recurrent ICT expenditure as a percentage of the annual institutional recurrent expenditure. However, the e-readiness framework does not measure the sources of funding for ICT expenditures. This report analyzes one of the main sources of funding for educational institutions, namely, student ICT lab fees.

In general, there are four sources of ICT funding for educational member institutions:

a. **External donor funding**, often for non-recurrent ICT expenditure.
b. **Government capitation or budget support,** often for public member institutions
c. **Institutional revenue,** mainly from tuition fees charged by educational institutions.
d. **ICT services fees charged to end-users.** An example is the student ICT lab fees charged by higher education institutions for use of ICT labs or access to on-campus internet.

The annual core surveys for prior to 2021 did not collect data on sources of financing for internet and ICT services. However, the 2021 annual core data report analyzed data on ICT lab fees revenues using the data from the following supplementary sources for universities only:

- Supplementary online survey of universities conducted in April 2022 through the ICT directors;
- 2019 e-readiness survey data of 44 universities; and
- Universities' fees catalog published on their respective websites (accessed in April 2022).

The 2021 survey results showed that 50 out of the 58 participating universities were charging a student ICT lab fee. In 2022, 52 of the 54 participating universities were charging ICT lab fees.

The 2022 annual core data survey included questions on student ICT lab fees charges for both universities and tertiary colleges analyzed in the next section.

8.2. 2022 survey of student ICT lab fees revenues

The 2022 survey showed that 52 out of 54 participating universities were charging student ICT lab fees (see Table 8.1) while only 10 of the 38 participating tertiary colleges were charging lab fees (Table 8.2). We derive

a few critical ICT indicators shown in Table 8.1 that demonstrate that student ICT lab fees could be a significant source of ICT financing in educational institutions.

Table 8.1 summarizes student ICT lab fees revenues for universities in the 2021 and 2022 surveys. The weighted **average ICT lab fees per student per year** for universities was **KES 2,300** for public universities and **KES 5,240** for private universities. This translated to about **KES 1.3 billion student lab fees annual revenue** for the 52 participating universities that were charging ICT lab fees. Table 8.1 also shows that the annual internet bandwidth expenditure represented only 42% of the total ICT lab fees revenue in public universities and 34% for private universities. The total recurrent ICT expenditure excluding ICT staff salaries was 66% and 143% of the total ICT lab fees revenue for public universities and private universities, respectively.

Table 8.1 also shows that the annual ICT staff remuneration was about KES 745 million, higher than the KES 422 million for annual internet bandwidth in public universities. Private universities had a similar pattern, with the annual ICT staff remuneration being KES 203 million compared to KES 151 million for annual internet bandwidth expenditure. *Thus, ICT staff salaries were a significant contribution to ICT recurrent expenditures.* This was a surprise since Section 7 indicated universities did not have enough critical ICT staff.

Table 8.1: Student ICT fees revenue in participating universities 2021 and 2022

Indicator	Public universities		Private universities	
	2021	*2022*	*2021*	*2022*
# of participating universities	29	31	21	21
Total student enrollment	371,874	435,652	126,962	85,224
Total student ICT lab fees revenue	1,504,353,536	1,001,817,597	482,328,271	446,605,609
Weighted unit ICT lab fee per student	**4,045.33**	**2,299.58**	**3,799.00**	**5,240.37**
Total annual internet bandwidth expenditure	416,042,295.38	422,636,592.72	203,715,294.84	151,543,590.55
Total ICT recurrent expenditure excluding staff salaries	504,610,961.21	661,967,864.68	433,653,568.71	637,923,609.39
Total ICT capital expenditure	230,643,363.7	451,383,301.10	140,268,746.43	123,698,875.72
Total ICT staff salaries	**593,158,815.57**	**745,306,524.16**	**219,095,989.46**	**203,550,039.09**
Total ICT recurrent expenditure + ICT staff salaries	1,097,769,776.69	1,407,274,388.84	652,749,558.17	841,473,648.48
% annual internet bandwidth expenditure to total ICT lab fees	**28%**	**42%**	**42%**	**34%**
% ICT recurrent expenditure to total lab fees (excluding staff salaries)	35%	66%	93%	143%
% ICT recurrent expenditure including salaries of annual lab fees	73%	140%	135%	188%
% Total ICT staff salaries to total annual lab fees	**39%**	**74%**	**45%**	**45%**

As noted above, only 10 of the 38 participating tertiary colleges were charging lab fees. Table 8.2 shows that the weighted annual lab fees per student was KES 4,488, higher than that for public universities at KES 2,300. ***The data shows that only 14% of the total ICT lab fees revenue was applied to internet bandwidth expenditure***. These results suggest that tertiary could achieve at least 50% of the KENET target of 100 Mb/s per 1,000 students by simply ring-fencing the student lab fees revenue.

The staff salaries represented only **15.2% of the ICT lab fees**, compared to 74% for public universities. This again suggests that tertiary colleges could also employ enough ICT staff using the ICT student lab fees. Increasing the median number of critical ICT staff to two would significantly impact the quality of ICT services provided by tertiary colleges.

Table 8.2: Student ICT lab fees revenue in participating tertiary colleges 2022

Indicator	Tertiary colleges
# of participating tertiary colleges charging ICT labs fees	10
Total student enrollment	73,465
Total student ICT lab fees revenue (KES)	329,718,569
Weighted unit ICT lab fee per student per year (KES)	**4,488**
Total annual internet bandwidth expenditure (KES)	48,734,766
Total subscription capacity (Mb/s)	1,166
Total ICT staff salaries	50,014,679
Total ICT CAPEX	71,745,991
Total ICT recurrent expenditure	90,848,488
% Internet expenditure to total ICT lab fees	14.8%
% ICT recurrent expenditure to total lab fees (including staff)	27.6%
% Total ICT expenditure (CAPEX + recurrent) to annual lab fees	49.3%
% Total ICT staff salaries to total annual lab fees	15.2%

8.3 Summary of results

This section concludes that educational institutions could enhance internet and ICT services by charging a modest student lab fee of about KES 4,800 per year. This translates to only KES 200 per month for unlimited internet services. This was adequate for achieving the KENET target for high-speed internet of 100 Mb/s per 1,000 users. Tertiary colleges subscribed to a very low internet bandwidth capacity and could increase it fivefold as well as employ the required critical ICT staff from revenues from the student lab fees.

While educational institutions could supplement ICT services costs by charging student lab fees this does not work for any of the other membership categories including teaching hospitals. There was therefore a need to explore other methods of sustaining high-speed internet in teaching hospitals, research institutes and other members of KENET.

9. Conclusions and Recommendations

9.1 Annual core data survey methodology

KENET started collecting annual core data in 2016 as part of monitoring and evaluation of its Strategic Plan 2016 – 2021 and associated annual work plans. The data was also used to provide a benchmarking service to KENET members, research-based ICT advocacy, and for resource mobilization for the community. The annual core data key indicators adopted were a subset of the hard facts sub-indicators of the e-readiness

framework used for e-readiness survey of universities since 2006 (see e-readiness portal at https://ereadiness.kenet.or.ke). *However, this 2022 annual core data report includes a new indicator on the compliance with the Data Protection Act of 2019.*

KENET published the first annual core data report in June 2022 titled **2021 Annual Core Data Report**. It was called the 2021 annual core data report because the sampling month for users' data was October 2021 but all expenditure data was based on the FY 2021/2022 (e.g. members' financial data). This second report is therefore titled **2022 Annual Core Data Report** because it is based on members' FY 2021/2022 data with a sampling month of October 2022 for users' data (i.e., students, faculty, researchers, and staff of member institutions). The core data was collected over a six-month period from January to June 2023.

The annual core data collection exercise is complex. Approval for data collection is granted by the CEO of the member institution who also must approve the release of the data. The data collection at each member institution is coordinated by the respective head of ICT. KENET treats the institutional data collected with utmost confidentiality and it is only released to the public in the annual core data report in aggregate form. However, participating institutions can access full benchmarking data of other participating institutions on condition that it is for internal use only.

KENET is a diverse research and education community that includes educational institutions, research institutes, teaching hospitals and institutions affiliated to the research and education community. The annual core data collection instruments were therefore customized for the following membership categories:

1. Universities (including university colleges);
2. Tertiary colleges;
3. Research institutes;
4. Teaching hospitals;
5. Capacity building institutions; and
6. Institutions affiliated to research and educational institutions.

Table 9.1 shows that only 111 institutions provided data from a total membership of 208 as of October 2022. In the 2021 survey, 108 members released data. However, the 111 participating institutions represented 80% of the users' population (the estimated total size of the community as of October 2022 was 920,537, most of them university students).

We note that only three membership categories released data in significant numbers, namely, universities, tertiary colleges, and teaching hospitals. This report therefore analyzed 98 member institutions in these three membership categories. This is an improvement over the 2021 report that analyzed data for universities and tertiary colleges only. However, benchmarking data shall be made available for all the 111 participating institutions. KENET shall continue to encourage the leadership of the other membership categories to participate in the annual core data surveys for the benefit of the research and education community of Kenya.

KENET has developed a benchmarking portal that will be available from July 2024. This is expected to increase the value of participating in the annual core data survey exercise in the future.

Table 9.1: Participation in the 2022 annual core data surveys

Membership category	#Members	Estimated total size of users'	#participating members	Total size of participating members community (annual core data)
Universities	68	669,935	54	580,510
Tertiary colleges	78	233,315	38	154,427
Teaching hospitals	9	6,351	6	5,273
Research institutes	20	4,982	6	3,248
Capacity building institutions	11	4,420	3	501
Affiliate institutions	22	1,534	4	318
Total	**208**	**920,537**	**111**	**741,029**

Source: 2022 Annual core data survey and KENET

9.2 Annual core data indicators and results

Annual core data survey benchmarking indicators are a subset of the e-readiness survey indicators defined in the e-readiness survey framework. Most of the indicators are based on hard facts, except for the extent of implementation of administrative information systems or ERPs indicator, that is based on the perception survey of heads of ICT or ICT directors.

The 2022 survey added two new indicators, namely, WiFi access points per 100 users and percent of participating institutions that had complied with Data Protection Act of 2019.

1. **Internet bandwidth per 1000 users** is one of the sub-indicators of internet availability indicator in an institution or community in the e-readiness framework.

2. **WiFi access points per 100 users** is a sub-indicator of internet availability on campuses or research stations or hospitals.
3. **Internet expenditure as a percent of the total institutional recurrent expenditure** is a sub-indicator of *ICT affordability* indicator in the e-readiness framework.
4. **Internet expenditure per 1000 users** was introduced in the 2022 survey but is the second sub-indicator of *ICT affordability* indicator in the e-readiness framework.
5. **Readiness for blended/online learning** is measured by the percentage of participating institutions that had deployed institution-wide learning management systems. This is a new sub-indicator of enhancing education with ICT indicator**.**
6. **Degree of deployment of administrative information systems** or ERPs, one of the sub-indicators of the *e-campus* e-readiness indicator, is measured as extent of implementation of ERPs according to the head of ICT. The summary measures only the percentage of participating institutions that had achieved full implementation.
7. **Mitigation of institutional business continuity risks** is measured using the availability of off-site backup or disaster recovery sites. This is one of the sub-indicators of the *networked campus environment* indicator.
8. **Availability of critical ICT human capacity** in an institution (i.e., network and systems administrators) is a sub-indicator of *ICT Human Capacity* e-readiness indicator. It is measured by the median number of critical ICT staff in the membership category.
9. **Student financing of internet and ICT services** in educational institutions is a new sub-indicator of ICT financing indicator. It measured two indicators, namely, the percentage of internet expenditure and ICT recurrent expenditure including ICT staff salaries to the student lab fees.
10. **Percent of members' compliance with the Data Protection Act of 2019** is a new indicator and is based on percentage of members who had registered as data controllers with the Office of Data Protection Commissioner (ODPC).

Table 9.2: Summary results of 2022 annual core data

Sub-indicator	Performance for universities	Performance for tertiary colleges	Performance for teaching hospitals
Internet bandwidth per 1000 users	52.3	15.5	176
WiFi access points per 100 users	0.7	0.3	4
Internet expenditure as a percent of the total institutional recurrent expenditure	0.76%	1.75%	0.10%
Internet expenditure per 1000 users	1,020,338.48	509,288.21	2,934,143.97
Readiness for blended/online learning	98%	63%	N/A
Degree of deployment of administrative information systems or ERPs	35%	32%	43%
Mitigation of institutional business continuity risks (i.e., *fully-fledged DR sites*)	20%	7%	33%
Availability of critical ICT human capacity (*median number of critical ICT staff*)	3	1	2
Percent annual Internet expenditure to annual student lab fees revenue	40%	14.8%	N/A
Percent of members in compliance with the Data Protection Act of 2019	22.2%	7.8%	16.6%

Table 9.2, summarizing indicators for universities, tertiary institutions, and teaching hospitals, shows low levels of compliance with Data Protection Act of 2019, especially for teaching hospitals at only 16.6%. Compliance was defined as registration of the institution as a data controller as a minimum although most of the participating institutions were also required to register as data processors with the Office of Data Protection Commissioner (ODPC). The number of critical ICT staff (i.e., systems administrators and network administrators) was also low even for universities, while for the tertiary institutions the median was one, with many having no critical ICT staff.

The WiFi coverage remained low at only 0.7 and 0.3 access points per 100 users for universities and tertiary colleges respectively. Educational institutions should aim for at least two access points per 100 users and higher density for student hostels (one access point per room for superior performance). We note the increase in internet bandwidth per 1,000 users that increased to 52.5 in 2022 from 40.0 in 2021 for universities. The tertiary colleges ratio increased to 15.2 per 1,000 users up from 10 per 1,000 users in 2021. However, only teaching hospitals achieved the 2022 KENET target of 100 Mb/s per 1,000 users. Universities will need to

double their subscription capacity while tertiary colleges need a sixfold increase. This is possible because only 14.8% of the student labs fees revenue was being applied to internet expenditure for the students. *The data suggests that the annual internet expenditure of educational institutions could be financed up 100% using student lab fees revenues.*

Digitalization readiness was still low due to the low implementation of ERPs. For example, only 35% of the universities reported that they achieved over 80% implementation. This is the minimum level of readiness for the digitalization phase of digital transformation. Similarly, only a small number of the participating institutions had set up a fully-fledged disaster recovery site, with hospitals leading in setting up DR sites.

9.3. Recommendations

This report highlights the following recommendations:

- **Educational institutions should aim to ring-fence annual student lab fees as one method of sustainably financing reliable and secure high-speed on-campus internet access to students and faculty and staff**. The student ICT lab revenues should be used to increase internet bandwidth capacity to the KENET target of *100 Mb/s per 1,000 users* and expand the on-campus WiFi coverage to a minimum of *two high-capacity WiFi access points per 100 users.*
- **Member institutions should recruit, retain and train enough critical ICT staff** (i.e., systems administrators and network administrators). For example, the 54 participating universities had an annual expenditure for ICT staff salaries of about KES 662 million compared to an annual internet expenditure of about KES 423 million (see Table 8.1). *It was therefore possible to reorganize the ICT staff expenditure to recruit critical staff and other staff necessary to support digital transformation initiatives*. For example, institutions could reduce the number of end-user ICT staff that were about 50% of the ICT staff complement.
- **Senior leadership should prioritize the implementation of ERPs with CEOs as the implementation champions.** We recommend the selection of only a few ERP types and vendors to build an ERPs user group around each of the ERP types. KENET constituted a Working Group on ERPs in the FY 2023/2024 that shall provide advisory services and develop guidelines for ERP implementation.
- **Institutional leaders should prioritize business continuity by setting up fully-fledged disaster recovery sites**. This will protect institutions against any failures of critical and mission-critical information systems that would disrupt the operations of institutions or from threats of cybersecurity attacks.

- **Educational institutions should aim to build sustainable, resilient, secure and sovereign digital learning platforms** that are fully integrated with remote teaching and collaboration platforms and anti-plagiarism. *Apart from using robust hardware and software platforms, educational institutions need to support local educational content development by hiring instructional designers and training faculty on content development and teaching with technology.*
- **KENET member institutions and their respective CEOs should prioritize compliance with the Data Protection Act of 2019**. This involves developing a Data Protection Policy, a Data Privacy Policy and registering as data controllers and/or data processors by December 2024.

Although this report is based on the 98 participating institutions in the categories of universities, tertiary colleges, benchmarking data is available for all the 111 participating institutions. KENET continues to encourage all the members to participate in the Annual Core Data survey for the benefit of the community and the beneficiary users.

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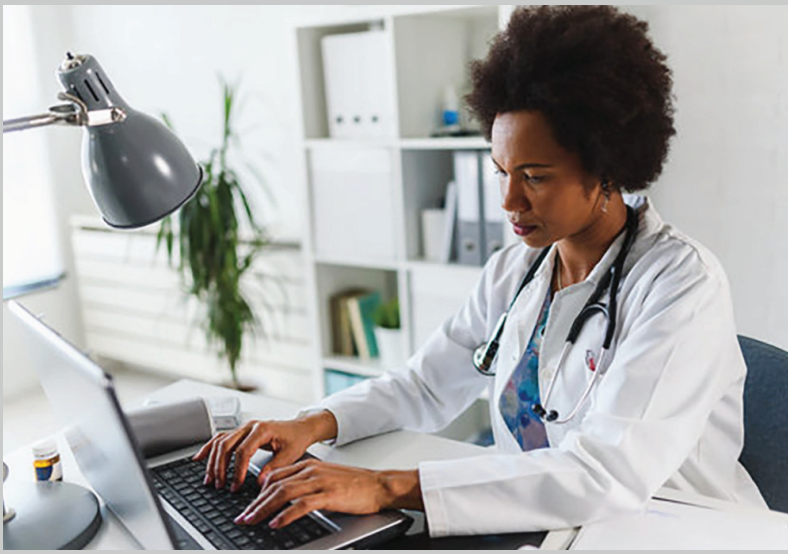

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