Library Resources Needed by University Libraries to Support Implementation of Blended Learning in Selected Public Universities in Kenya

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ARTICLE INFO

Article history:
Online First 18 November 2026

Keywords:
Blended Learning,
Library Resources,
Digital Literacy,
University Libraries,
Kenya

ABSTRACT

Libraries are a great platform that supports blended learning as they are believed to unify paradigm to handle the revolutionary changes in how learners interact, create, and access information. This study sought to investigate the library resources needed in implementation of blended learning in selected public universities in Kenya. The objective of this study was to establish the library resources needed by public university Libraries. This study was a qualitative research that descriptive research method. The study was guided by technology acceptance model (TAM) which explains how users accept and use technology. Data was collected using stratified random sampling and a sample size of 344 participants, including librarians, library staff, faculty members, and Postgraduate Students, was utilized. The data collection instruments were interview guides and semi-structured questionnaires. Data was presented using both descriptive statistics and content analysis. The data was analyzed using statistical package for social sciences (SPSS). The findings of the study showed that although libraries provided virtual reference and e-resources, gaps remained in ICT infrastructure and digital collections. Integration of digital resources with Learning Management Systems (LMS) was limited and inconsistent. Learners faced challenges in accessibility, navigation, and awareness of available resources. The findings of this study were guidance to policymakers, university administrators, and library professionals in optimizing the contribution of libraries to the blended learning paradigm. The study supported the Sustainable Development Goals (SDGs), Kenya's Vision 2030 on education, emphasizing competitive quality education and training. It provided valuable insights into how libraries could effectively support modern educational models. The findings helped library administrators and staff enhance their services, making them more aligned with the needs of students and faculty engaged in blended learning.

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1. Introduction

Since the late 1990s, blended learning has been a part of higher education. Over the years, its popularity has increased. The United States is the most outstanding country in offering blended online courses (Barbour & Hodges, 2024). In the United Kingdom, blended learning is significantly used for students with accessibility needs (Pearson et al., 2019). Emerging economies like Taiwan, Indonesia, India, Brazil, and Turkey also adopted blended learning, increasing online education (Nadlifatin et al., 2020). The demand for blended learning in these countries increased with the continued growth of distance learning and situations that demanded the physical separation of instructors and learners. In Kenya blended learning gained momentum with the emergence of COVID-19 especially in Universities. The new norm of avoiding traditional classroom instruction methods promoted the use of blended learning. However this new phenomena was faced with un-preparedness although it created a room for flexibility in learning. During post COVID-19 period higher learning institution have embraced both traditional conventional learning in Kenya and blended learning. Blended learning in Kenya has been facing several challenges hindering its effectiveness.

With an ever-increasing number of higher education institutions in Kenya providing at least some of their services in hybrid mode, blended learning in higher education has led some to regard it as the "new normal." This continued adoption of blended learning significantly contributes to academic achievement success in the higher education system. Some benefits attributed to blended learning are growth of autonomy and self-directed learning, more interaction between students and staff, chances for professional development, more flexibility for staff and students, personalization, improved student outcomes, cost savings, and satisfaction from both staff and students.

Blended learning in the libraries is depicted by information repackaging services and the librarian's ability to choose, get, process, audit, criticize, preserve, and create information. An integrated learning experience is provided by connecting the learning modalities throughout a student's learning path, which may entail leveraging data from online learning to guide and inform a student's offline learning. Libraries are a great platform that could support blended learning as they are believed to have a unified paradigm to handle the revolutionary changes in how learners interact, create, and share information, as well as participatory environments, building on the fundamental competencies of information literacy (Brine & Knight, 2021).

The benefits of blended learning are immense. The pedagogy connects people, activities, and events. It is an essential instrument for building understanding on an international basis. Furthermore, student-teacher and student-to-student contact help to develop online communities and learning practices where information, ideas, insights, and other learning outcomes are exchanged and valued. Blended learning improves the learning content and the method without replacing the instructor's function in the classroom. The approach helps to meet students' distinct needs, leading to optimal learning outcomes (Amiruddin et al., 2022). Blended learning creates a healthy learning environment that motivates students to explore resources provided, resulting in blended learning awareness and autonomous learning, including critical thinking, in-depth learning, and reflection (Chen & Chen, 2022).

The difficulties of implementing blended learning have also been widely publicized in higher

education, including a lack of staff members capable of interacting with blended learning, opposition to change and innovation, and a shortage of models based on research to assist institutional adoption (Smith & Hill, 2019). Traditional learning practices have been dominant in developing countries, with little adoption of blended learning practices compared to developed states (Anthony et al., 2020). Faculties continue emphasizing face-to-face instruction, which students easily identify with (Abusalim et al., 2020). This phenomenon requires more research to address possible implementation and adoption challenges.

There has been a significant improvement in learning methods over the years to ensure all students' needs are catered to. The combination of various learning methods, better defined as blended learning, is being practiced to ease the learning process (Aryal, 2025). Blended learning includes student-centered environments, independent learning, peer learning, collaborative learning, and reflective thinking (De Bruijn-Smolders & Prinsen, 2024). Despite progress, challenges remain, particularly regarding digital infrastructure, training, and alignment of services with blended learning requirements. This study examines the information services provided by university libraries to support blended learning in selected public universities in Kenya.

2. Empirical Review

2.1 Information services for blended learning

As Barbuti et al. (2019) note, a project on enhancing digital skills and competencies of librarians in Europe called BIBLIO has shown that libraries were beginning to invest more in digital infrastructure and digital resources to enable virtual interaction between lecturers and students, providing them with more personalized instructional strategies like audio and video recording over the internet. Moreover, libraries offered instructional resources such as videotapes, CD-ROMs, and web-based instructional videos to improve the instructional technologies and combine various pedagogical strategies (Horsfall et al., 2021). In addition, libraries provided online databases, e-books, e-journals, and e-lecture notes to learners to ensure that they understand course concepts taught using online and face-to-face platforms (Horsfall et al., 2021). Equally, a Taiwanese study by Teng et al. (2009) discovered that libraries had invested in electronic media and internet-based products like digital boards, projectors, video conferencing applications like Zoom, Skype, and Google Meet, instant messaging and cloud collaborative tools such as WhatsApp, Telegram, Google Docs, OneDrive and email. All these results highlight the vital contribution of libraries in improving the blended learning processes by virtue of digital innovation and integration of interactive technologies.

In their research paper on the rapid transition to digital resources in academic libraries in the UK (Brine & Knight, 2021) found out that institutional repositories, library websites, and open-access journals have revolutionized learning, making it possible to use interactive resources like video conferencing, online presentations, and e-assessment sites. Such developments portray the growing role of libraries in enhancing blended learning via digital innovation. Nevertheless, although this can be seen in developed setting, most Kenyan higher learning institutions are still held back by

poor technology facilities and lack sufficient funding to completely duplicate these interactive teaching and learning centers. In Kenya, libraries thus should consider enhancing digital archive facilities and embrace inexpensive open access resources so that they can facilitate virtual learning aspects, particularly where students are overly dependent on mobile internet access.

Adebayo et al. (2019) noted that the advent of blended learning as a result of the spread of ICT and e-learning necessitates the redesigning of libraries in terms of their operations and service models. On the same note, Matizirofa et al. (2021) indicated that the University of Pretoria made possibilities of digital products and services that helped the students to access electronic resources, watch lectures online, and do assignments online. These papers explain that libraries serve as mediators between technology and pedagogy. Nevertheless, Kenyan libraries continue to experience gaps in digitization, subscribe to the e-resources and lack of integration of learning management systems (LMS). In order to successfully apply blended learning, Kenyan libraries should thus not just digitalize their resources, but ensure that they enhance cooperation with academic departments in order to integrate them into the delivery of the courses.

Kathula (2021) also pointed out that libraries should make sure that the updated and repackaged information sources, including both print and digital ones, are available to enable the learning process to be more engaging. This observation also concurs with the fact that Kenyan libraries should offer resources that facilitate the online and offline learning processes. Nevertheless, although librarians are capable of selecting, processing, and preservation of information, one of the greatest challenges is how to tailor the information to meet the needs and technological situations of various users. The development of localized content, the presentation of resources in multiple languages, and repackaging the material into the consumable formats should therefore be the core values of Kenya libraries to ensure inclusivity in blended learning.

Finally, Atieno Ayere (2022) observed that whereas developed nations have properly outfitted libraries that facilitate video streaming and interactive devices, the majority of Kenyan universities have access to one of the simplest technologies, especially smartphones, to access digital content. This highlights the digital divide that has remained to define the Kenyan higher education arena. As much as the researches done in the developed settings can offer valuable lessons on the place of libraries in supporting blended learning, empirical research done in Kenya on the adaptation of libraries to the local challenges (poor bandwidth, budget constraints, and the needs of different learners) is lacking. This gap explains why it is essential that local studies are conducted to inform policy and practice towards the effective integration of libraries in the implementation of blended learning in Kenya.

3. Methodology

The study targeted Chuka, Kirinyaga, and Embu universities, selected through purposive sampling to represent Tharaka-Nithi, Embu, and Kirinyaga counties. This selection was made to capture diverse experiences, strategies, and challenges encountered by university libraries in supporting blended learning, thereby ensuring a more comprehensive understanding of the phenomenon.

A descriptive survey research design was selected for the study to investigate the role of libraries in the implementation of blended learning in selected universities in Kenya. The design was preferred because it allowed for the collection of primary data from the targeted population (Kintu et al., 2017). It was particularly suited for gathering descriptive data that could be summarized using tables, graphs, and charts to provide a clearer understanding of the respondents' insights, views, and knowledge (Levitt et al., 2018). Descriptive narration was also used to explain the causes, reasons, and effects of the current situation.

The participants encompassed four distinct categories: librarians, library staff members, teaching staff, and postgraduate students who had experienced blended learning at the selected universities. The inclusion of librarians, teaching staff, and library staff was intended to provide insights into the library's role in implementing blended learning initiatives, while postgraduate students were included to offer feedback based on their firsthand experiences of utilizing library resources in blended learning environments. The target population referred to the entire group of individuals the research sought to study and infer from, whereas the sample size represented a subset of that population. In this study, the target population consisted of 3 librarians, 18 library staff members, 9 teaching staff, and 60 postgraduate students.

The researcher collaborated with university administrations and faculty members to identify the 90 library users who had experienced blended learning. This collaboration helped to determine courses or programs that incorporated blended learning methodologies and ensured that only students who had actively used library resources as part of their blended learning experience were eligible for inclusion. A stratified random sampling procedure was adopted to guarantee adequate representation of each category of participants. The target population was divided into four strata librarians, library staff, teaching staff, and postgraduate students and a random sample was drawn from each stratum using proportionate allocation. The specific sample size for each stratum was determined through appropriate statistical methods, including the Yamane formula, to ensure representativeness and statistical validity.

Table 1. Target population for the selected Universities

	Chuka	Embu	Kirinyaga	
Population. Category	**Target population**	**Target Population**	**Target Population**	**Total Population**
Postgraduate students	500	434	350	1284
Library staff	19	13	10	42
Faculty members	550	350	230	1130
Librarians	1	1	1	3
Total	**1070**	**798**	**591**	**2459**

Source CU, UoEM and KyU 2025

3.1 Sampling Procedure and Sample Size

The sample size for this study was 344 participants. This sample size was calculated using the

Yamane formula. This formula is commonly used to determine the sample size for descriptive research studies. The formula is expressed as;

Where n is the sample size, N is the target population, and e is the margin of error.

$$n = N/(1 + N(e^2))$$

In this study, N is the population from the three Universities, and e is 0.05. The sample size will be calculated as follows;

$$n = N/(1 + N(e^2))$$

$$N = 2459, \quad e = 0.05$$

$$n = \frac{2459}{1 + 2459(0.05)^2}$$

$$n = \frac{2459}{1 + 2459(0.0025)}$$

$$n = \frac{2459}{1 + 6.1475}$$

$$n = \frac{2459}{7.1475}$$

$$n \approx 344$$

Therefore, the calculated sample size for this study is 344 participants, representing the target population.

The stratified random sampling was used to calculate the sampling frame. Based on the implemented blended learning, the population was divided into different strata. A random sample will be selected from each stratum. This method ensured that each stratum is represented in the sample, increasing the accuracy and representativeness of the findings. The technique involved dividing the population into these groups and randomly selecting individuals based on shared attributes or characteristics. The specific numbers chosen include 3 librarians, 34 library staff, 95 faculty members, and 1284 Postgraduate Students reflect the relative sizes or significance of these strata within the population. The approach ensures a representative sample by capturing diverse perspectives from each stratum, enabling more accurate insights while avoiding bias that might arise in simpler sampling methods. Table 2 shows the sampling frame.

Table 2. Sample Size for Selected University

Strata	Number Selected	Sampled
Librarians	3	3
Library Staff	42	34
Faculty Members	1130	95
Postgraduate Students	1284	212

Total	**2459**	**344**

3.2 Research Instruments

As Sarantakos (2017) suggested, the primary data collection instruments for this research were questionnaires and interviews. These instruments are widely used in survey research due to their ability to collect quantitative and qualitative data.

3.3 Questionnaires

The questionnaire was used to obtain responses from postgraduate students and library staff at the selected universities in Kenya.

According to Paradis et al. (2016), questionnaires are preferred for their simplicity in quantifying responses, ease of scrutiny and comparison, and simplicity in designing and administering them. Additionally, questionnaires guarantee respondents' anonymity, freedom of expression, and confidentiality, essential factors in this study. The organization of the questionnaire was divided into three parts, as follows:

Part 1: Demographic Information, comprising respondents' gender, Level of education, Years of experience, Section in the library, and the name of the University.

Part 2: Library Role in Blended Learning Implementation, which was designed to gather data about the extent to which the respondents agree that the library plays a crucial role in the implementation of blended learning in their University, the specific services that the library offers to support blended learning, the satisfaction level of the respondents with the services offered by the library to support blended learning, and the frequency of use of these services.

Part 3: Library Resources and Services was designed to gather data about the sufficiency of library resources to support blended learning in their University, the resources that the library needs to improve its support for blended learning, and the extent to which the library provides information services that support blended learning in their University.

The questions in the questionnaire will mainly be closed-ended, organized in a Likert scale range of 1-5. The responses were systematically arranged to cover all constructs of the study. Sections were numbered alphabetically to mark each study variable. Some open-ended probing sentiments will also be included.

3.4 Interviews

The interview, guided by an interview schedule, was conducted with librarians, library staff, and teaching staff to obtain in-depth qualitative data and clarify complex issues, as emphasized by (Showkat & Parveen 2017). Their responses offered valuable insights into policies, library frameworks, and standard operating procedures supporting blended learning implementation. The interview consisted of open-ended questions covering demographics, independent variables, and the dependent variable, all aligned with the study objectives. It was administered orally, with participants verbally sharing their responses, while the interviewer recorded the answers either electronically or through

notes with the participants' consent, in line with (Scheurich, 1997). To ensure clarity and systematic coverage, the interview schedule was organized according to the study variables.

Piloting was conducted to evaluate the effectiveness and suitability of the research instruments in meeting the study objectives by identifying errors, inconsistencies, and content appropriateness. Content validity was established through a review of prior studies, alignment with existing literature and theoretical frameworks, and face validity testing via a pilot study in a selected university to assess consistency, completeness, and relevance, with feedback incorporated for refinement. Construct validity was ensured by structuring the instruments into sections addressing all study variables. Reliability was assessed using Cronbach's alpha coefficient, calculated from pilot responses through SPSS, with a threshold of 0.7 or above considered acceptable. Consistency of responses among participants with similar characteristics over time further supported reliability, confirming that the instruments produce stable results across multiple applications. This comprehensive piloting process strengthened the robustness, validity, and reliability of the instruments, thereby enhancing the credibility and accuracy of findings on the role of libraries in supporting blended learning in Kenyan universities.

4. Results

4.1 Response Rate

The response rate is a critical indicator of the quality and credibility of data collected in survey research. Table 1 presents the response rates of postgraduate students and library staff from Chuka University (CU), University of Embu (UoEm), and Kirinyaga University (KyU).

Table 3. Response rate of postgraduate students

University	Postgraduate Students			Library Staff		
	Sample	Response (f)	Response rate	Sample	Response (f)	Response rate
Chuka (CU)	137	84	61%	19	18	95%
Embu (UoEm)	91	68	75%	7	7	100%
Kirinyaga (KyU)	74	60	81%	10	9	90%
Total Sample	**302**	**212**	**70%**	**36**	**34**	**94%**

As shown in Table 3, the overall response rate for postgraduate students was 70%, while that of library staff was 94%. University-specific response rates for postgraduate students ranged from 61% (CU) to 81% (KyU), whereas library staff response rates were consistently high, ranging from 90% to 100%.

A response rate of 70% among postgraduate students is considered acceptable for academic research and indicates sufficient participant engagement (Mohajan, 2018). High response rates generally reduce the risk of non-response bias and enhance the representativeness of the data (Nulty, 2008). Notably, the 94% response rate among library staff reflects strong participation, which enhances the credibility of insights derived from this group. Such high response rates in small populations—like library staff—are particularly significant because each response contributes meaningfully to the overall analysis

(Saunders et al., 2019).

According to Krosnick (2017), a response rate above 60% is generally sufficient to draw valid conclusions in social science research, especially when the sampling method and participant targeting are well-aligned. Therefore, the response rates achieved in this study support the validity and generalizability of the findings, especially when interpreting the role of university libraries in blended learning.

4.1.1 Background information of postgraduate students

Table 4 provides information on the gender, level of study, and institutional distribution of the postgraduate student respondents who participated in the study.

Table 4. Gender and the Highest level of education qualification of postgraduate students

Aspect of background	Frequency	Percentage
Gender		
Female	113	53.3
Male	99	46.7
Total	**212**	**100.0**
Level of study		
Master's degree	137	64.6
PhD	75	35.4
Total	**212**	**100.0**
Name of the university		
UoEm	68	32.1
Chuka	84	39.6
Kirinyaga	60	28.3
Total	**212**	**100.0**

The results on gender distribution show that slightly more than half of the respondents were female (53.3%), while males constituted 46.7%. This finding reflects a narrowing gender gap in postgraduate education in Kenya, which aligns with recent national trends in higher education participation Commission for University Education (CUE, 2022). The near-equal representation indicates a balanced perspective in the findings across gender lines, which is important for equity-focused discussions on blended learning implementation.

Regarding academic level, most respondents (64.6%) were master's degree students, while PhD students constituted 35.4%. This distribution suggests that master's programs remain the most subscribed postgraduate qualification in Kenyan universities. Due to coursework intensity, master's students may be more actively engaged with blended learning platforms, making their responses particularly relevant to this study.

In terms of institutional representation in this study, Chuka University had the highest number of respondents (39.6%), followed by the University of Embu (32.1%) and Kirinyaga University (28.3%). This balanced distribution across the three universities enhances the generalizability of the findings and ensures a broader institutional perspective on how libraries support blended learning

across different academic environments. The demographic characteristics of the postgraduate students reflect a diverse and representative sample suitable for exploring the role of university libraries in supporting blended learning in Kenyan higher education.

4.1.2 Background information of library staff

In this study, the demographic analysis of library staff provides valuable insight into their diversity, qualifications, and institutional contexts factors that are important for understanding their capacity to support blended learning. Table 3 presents information on gender, educational qualifications, workstation roles, work experience, and institutional affiliation of the library staff.

Table 5. Demographic information of library staff

Aspect of background	Frequency	Percentage
Gender		
Male	16	47.1
Female	18	52.9
Total	**34**	**100.0**
Level of Education qualifications		
Diploma	11	32.4
Bachelor's degree	18	52.9
Master's degree	5	14.7
Total	**34**	**100.0**
Workstation		
Circulation desk	8	23.5
Collection development	3	8.8
Technical	9	26.5
Reference	2	5.9
Periodicals	2	5.9
Multimedia/Audio-visual/ Reprographic	2	5.9
E-resources	5	14.7
Post-graduate	3	8.8
Total	**34**	**100.0**
Work experience		
Less than 3 years	1	2.9
3-5 years	7	20.6
6-8 years	5	14.7
9-10 years	7	20.6
More than 10 years	14	41.2
Total	**34**	**100.0**
Name of the university		
UoEm	10	29.4
Chuka	14	41.2
Kirinyaga	10	29.4
Total	**34**	**100.0**

The findings revealed that the gender distribution of library staff was nearly equal, with 52.9% female and 47.1% male. This reflects the broader trend toward gender parity in the Kenyan library and information sector (Makori, 2021), and suggests that diverse perspectives are represented in research, service delivery, and technology adoption in libraries. In terms of education, most staff held bachelor's degrees (52.9%), followed by diplomas (32.4%) and master's degrees (14.7%). This profile corresponds with typical staffing structures in Kenyan university libraries, where professional roles usually require at least a bachelor's degree. Although only a minority held postgraduate qualifications, their expertise was seen as important for supporting blended learning, especially in areas such as digital content development and instructional design.

Work allocation showed that staff were most represented in technical services (26.5%), circulation

(23.5%), and e-resources (14.7%), with fewer working in reference, multimedia, periodicals, and postgraduate services. This reflects the complex nature of academic library operations and the need for cross-departmental collaboration in blended learning esources and multimedia, which are critical for blended environments, suggests possible capacity gaps. On work experience, 41.2% had served for more than 10 years, while 20.6% had between 3−5 years and another 20.6% between 9−10 years. Such experience is an advantage in adopting and managing digital services, as longer-serving staff bring institutional knowledge and are well placed to guide others during transitions to blended learning models.

Library staff were almost evenly distributed across the three institutions that participated in this study, with Chuka University contributing the highest proportion (41.2%), and University of Embu and Kirinyaga University each accounting for 29.4%. This balanced institutional representation provides a strong comparative basis for analyzing how different university libraries support blended learning initiatives. The demographic profile of library staff reported above indicates a well-qualified and experienced workforce capable of supporting blended learning. However, the relatively limited representation in key blended learning areas such as multimedia and e-resources calls for strategic capacity-building and professional development initiatives.

4.2 Library Resources Needed

The second research objective was aiming to establish the library resources needed to support the implementation of blended learning in selected universities in Kenya. Several sentiments were presented to library staff in Likert scale. The sentiments covered aspects such as availability of diverse digital resources, including e-books and e-journals; curation and accessibility of open-access materials, provision of multimedia resources for blended learning; digital accessibility support for users with disabilities; reliable remote access to library resources; balanced collection of print and digital materials; and regular updates to digital collections to align with evolving learning needs.

4.2.1 Findings from library staff

This section presents the findings from library staff (n = 34) regarding the adequacy and accessibility of information resources in supporting blended learning in selected universities in Kenya. Key indicators were drawn from the proportions of respondents who selected "Agree" and "Strongly Agree" versus those who selected "Disagree" and "Strongly Disagree," with "Neutral" responses providing insight into uncertainty or mixed experiences. Mean scores and standard deviations were used to interpret central tendencies and variability in responses. as shown in Table 9.

Table 6. Library staff responses

NO.	Statements on information resources for supporting the implementation of blended learning (n=34)	SD(1)	D(2)	N(3)	A(4)	SA(5)	Mean	Std. Dev
1	The library has sufficient e-books, e-journals, and digital resources to	1(2.9%)	0	3(8.8%)	19(55.9%)	11(32.4%)	4.15	.821

	support blended learning.							
2	Open-access materials are well-curated and easily accessible for blended learning students.	0	0	6(17.6%)	15(44.1%)	13(38.2%)	4.21	.729
3	The university library provides adequate multimedia resources for blended learning courses.	0	2(5.9%)	7(20.6%)	13(38.2%)	12(35.5%)	4.03	.904
4	The library ensures accessibility of digital resources for users with disabilities.	1(2.9%)	7(20.6%)	6(17.6%)	12(35.3%)	8(23.5%)	3.56	1.160
5	Remote access to library resources is well-supported and reliable.	0	0	2(5.9%)	17(50.0%)	15(44.1%)	4.38	.604
6	Print and digital resources are well-balanced to support both face-to-face and online learning.	0	0	2(5.9%)	20(58.8%)	12(35.3%)	4.29	.579
7	The library regularly updates its digital collections to align with emerging blended learning needs.	0	0	3(8.8%)	19(55.9%)	12(35.3%)	4.26	.618

The most notable finding is that remote access to library resources is well-supported and reliable, with an overwhelming 94.1% of the respondents (n = 32; 17 [50.0%] Agree and 15 [44.1%] Strongly Agree) affirming this. Only 5.9% (n = 2) were Neutral, and no respondent disagreed. This item had the highest mean score of 4.38 (SD = 0.604), indicating strong consensus and very low variability in perception. The low standard deviation suggests that most library staff consistently experience well-structured and dependable remote access systems. These results reflect successful digital transformation efforts within Kenyan academic libraries.

Another highly rated item was the balance between print and digital resources to support both face-to-face and online learning, with a combined 94.1% (n = 32; 20 [58.8%] Agree and 12 [35.3%] Strongly Agree) in support. Only 5.9% (n = 2) remained Neutral, and none disagreed. This yielded a high mean score of 4.29 (SD = 0.579), reflecting a strong consensus and minimal variation. The narrow standard deviation demonstrates consistency in how respondents view the library's ability to cater to both traditional and digital learners an important consideration in blended learning environments, as supported by Njoroge & Mutwiri (2022), who emphasized the need for resource hybridity in post-pandemic academic settings.

Similarly, regular updating of digital collections emerged as a significant strength. A total of 91.2% of respondents (n = 31; 19 [55.9%] Agree and 12 [35.3%] Strongly Agree) confirmed this practice, with only 8.8% (n = 3) Neutral and no disagreements reported. The mean was 4.26 (SD = 0.618), again indicating a high level of agreement with minimal dispersion. Regular updates suggest responsiveness to evolving curriculum and research demands and show that libraries are actively engaging in the sustainability of digital content a practice encouraged by Ndaba & Dube (2022), in their study on strategic digital collection development in African universities.

Moreover, the finding that open-access materials are well-curated and easily accessible received strong approval from 82.3% of respondents (n = 28; 15 [44.1%] Agree and 13 [38.2%] Strongly Agree), while 17.6% (n = 6) were Neutral and none disagreed. The mean was 4.21 (SD = 0.729),

revealing strong support with relatively low variability. This finding underscores the increasing reliance on open educational resources (OERs) to reduce costs and expand access to quality academic content—a direction supported by UNESCO's open education movement and echoed in the work of Muli and Ouma (2021).

A relatively weaker—but still important—finding was on digital accessibility for users with disabilities, where a lower 58.8% (n = 20; 12 [35.3%] Agree and 8 [23.5%] Strongly Agree) expressed satisfaction. In contrast, 23.5% (n = 8) disagreed or strongly disagreed, and 17.6% (n = 6) remained Neutral. This item had the lowest mean among all the items, M = 3.56 with SD = 1.160, suggesting both moderate agreement and higher variability. This points to inconsistencies in inclusive digital design and suggests a pressing need for libraries to strengthen assistive technologies and accessibility policies. These findings echo those of Maina et al. (2026), who highlighted that most Kenyan universities are still lagging behind in implementing inclusive digital platforms for students with disabilities.

These findings imply that academic libraries in Kenya are making significant progress in developing robust and reliable digital infrastructure to support blended learning. Particularly, libraries have excelled in remote access provision, balancing print and digital collections, curating open-access materials, and updating digital collections. However, the notable inconsistency in support for users with disabilities calls for immediate attention to inclusive service provision. Libraries should therefore adopt universal design principles, invest in assistive technologies, and conduct regular accessibility audits to ensure equitable access. Additionally, the strong support for open-access resources indicates growing awareness and adoption of sustainable, cost-effective academic content models, which should be further supported through training and integration into curricula.

4.2.2 Findings from Postgraduate Students

The findings from postgraduate students (n = 212) regarding the adequacy of information resources to support blended learning in selected Kenyan universities revealed several noteworthy findings. The interpretations below focus on the most outstanding results, highlighting frequencies, percentages, means, and standard deviations (SD), and discussing their implications in the context of recent scholarly literature. The findings are summarized in Table 10.

Table 7. Postgraduate students' responses

NO.	Statements on information resources(n=212)	SD(1)	D(2)	N(3)	A(4)	SA(5)	Mean	Std. Dev
1	The library provides sufficient electronic resources to support my coursework and research.	6(2.8%)	0	20(9.4%)	119(56.1%)	67(31.6%)	4.14	.806
2	Open-access resources are well-organized and accessible for my academic needs.	0	0	40(18.9%)	94(44.3%)	78(36.8%)	4.18	.726
3	The university provides access to updated scholarly databases that support blended learning.	0	13(6.1%)	48(22.6%)	79(37.3%)	72(34.0%)	3.99	.903

4	The library ensures that both print and digital resources complement my blended learning experience.	6(2.8%)	48(22.6%)	38(17.9%)	72(34.0%)	48(22.6%)	3.51	1.154
5	Multimedia resources (e.g., videos, podcasts, interactive modules) are useful in my studies.	0	0	14(6.6%)	107(50.5%)	91(42.9%)	4.36	.604
6	I can access library resources remotely without major challenges.	0	0	14(6.6%)	126(59.4%)	72(34.0%)	4.27	.577
7	The university frequently updates its digital library resources to meet my academic needs.	0	0	21(9.9%)	118(55.7%)	73(34.4%)	4.25	.621

One of the most prominent findings was that multimedia resources such as videos, podcasts, and interactive modules are considered useful in students' studies, with a significant 93.4% (n = 198; 107 [50.5%] Agree and 91 [42.9%] Strongly Agree) affirming this. Only 6.6% (n = 14) remained Neutral, and no respondents disagreed. This item recorded the highest mean score of 4.36 (SD = 0.604), indicating a strong and consistent level of agreement among respondents. The low standard deviation reflects minimal variation in student experiences, pointing to the widespread effectiveness and acceptance of multimedia content in enhancing comprehension and engagement. This finding supports the work of Ifijeh & Yusuf (2020), who emphasized that multimedia tools significantly boost learner interaction and motivation in blended learning contexts.

The remote access to library resources without major challenges received overwhelming support from respondents. A combined 93.4% (n = 198; 126 [59.4%] Agree and 72 [34.0%] Strongly Agree) affirmed seamless access, with only 6.6% (n = 14) Neutral and no disagreement. This item had a high mean of 4.27 (SD = 0.577), suggesting that remote access infrastructure is well-developed and consistently dependable. The low SD demonstrates minimal deviation in responses, further reinforcing the uniformity in student satisfaction with remote access. These results align with findings by Matizirofa et al. (2021), who reported that robust remote access mechanisms are key enablers of learning continuity in blended and online education formats.

Another significant area of strength was the university's commitment to updating its digital library resources to meet students' academic needs. A total of 90.1% (n = 191; 118 [55.7%] Agree and 73 [34.4%] Strongly Agree) agreed with this statement, while 9.9% (n = 21) were Neutral, and no respondents disagreed. The mean was 4.25 (SD = 0.621), indicating strong central agreement with little variability in responses. Regular updating of digital content ensures that students have access to the most relevant and credible sources, enhancing the quality of academic work. This is consistent with observations by Mi et al. (2021), who emphasized the importance of dynamic digital collections in ensuring the relevance of library services in evolving academic landscapes.

At the same time, open-access resources were found to be well-organized and accessible, with 81.1% (n = 172; 94 [44.3%] Agree and 78 [36.8%] Strongly Agree) expressing satisfaction. 18.9% (n = 40) selected Neutral, and no one disagreed. The mean was 4.18 (SD = 0.726), indicating general approval with relatively low variation. This reflects the growing maturity of open educational resource (OER) strategies in university libraries, which are crucial for supporting equitable access

to knowledge, particularly for students facing financial constraints.

Additionally, a substantial 87.7% (n = 186; 119 [56.1%] Agree and 67 [31.6%] Strongly Agree) reported that the library provides sufficient electronic resources to support coursework and research. Only 9.4% (n = 20) were Neutral, while 2.8% (n = 6) disagreed. This item had a mean of 4.14 (SD = 0.806), showing high agreement but with slightly more variability than previous items. This suggests that while most students find e-resources sufficient, some variability in access or availability across institutions may exist. Ensuring consistent access to academic databases and journals remains vital in this regard.

Conversely, the complementarity of print and digital resources recorded the lowest satisfaction levels among the prominent items. Only 56.6% (n = 120; 72 [34.0%] Agree and 48 [22.6%] Strongly Agree) felt that both formats complement their blended learning experience. A notable 25.4% (n = 54; 48 [22.6%] Disagree and 6 [2.8%] Strongly Disagree) expressed dissatisfaction, while 17.9% (n = 38) were Neutral. The mean was 3.51 (SD = 1.154), with the highest standard deviation among all items, indicating significant variability in responses. This points to inconsistencies in how institutions are managing hybrid resource strategies. According to Njoroge & Mutwiri (2022), effective integration of print and digital content is essential to support students with varied preferences and learning environments, especially in resource-constrained regions.

The above findings demonstrate that postgraduate students perceive university libraries in Kenya as largely effective in supporting blended learning, particularly through multimedia integration, remote access, and timely updates of digital collections. However, there is a need for improvements in the integration of print and digital resources to ensure that all students benefit equally, regardless of their learning mode or access challenges. The findings also indicate a need for university libraries to continue enhancing open-access initiatives and ensure consistency in the delivery of electronic resources across institutions. Strategic planning in academic libraries must prioritize student-centered resource delivery models to meet the evolving demands of blended learning.

4.2.3 Qualitative findings on library resources

The views of university librarians on adequacy of the current digital and physical resources in supporting blended learning at their institutions were sought. A dominant theme across the responses is the recognition that digital resources are “relatively adequate and continue to grow,” with the university “in the process of improving its digital resource collection.” Access to e-journals, e-books, databases, and an institutional repository through platforms such as MyLOFT demonstrates an intentional move towards supporting blended and online learning modalities. These efforts align with findings by Nyamboga et al. (2024), who emphasized the need for African universities to continually upgrade their digital collections to support flexible learning environments. Although there is evident growth, the digital collections are still “somewhat limited compared to larger institutions,” pointing to a disparity in resource availability, often influenced by budget constraints and institutional priorities (Mbonu-Adigwe et al., 2021).

Another notable concern is “inconsistent access to digital platforms” due to “technical problems and internet bandwidth constraints.” Even with the availability of digital resources, remote access

is sometimes disrupted, limiting students' ability to engage in uninterrupted learning. This reflects a wider challenge in the African context, where limited ICT infrastructure remains a significant barrier to fully realizing the benefits of blended learning (Mtebe & Raisamo, 2014). The issues of inadequate internet speed and limited access devices further exacerbate this challenge, highlighting the need for ongoing investment in ICT infrastructure.

The responses indicate that while the physical library facilities such as computers, study spaces, and internet are "adequate," there is a recurrent problem of overcrowding "especially during peak times." The phrase "demand sometimes exceeds supply" was echoed in multiple responses, indicating that physical infrastructure is under pressure. This scenario is common in institutions transitioning to blended learning, where hybrid students still rely heavily on on-campus facilities for connectivity, printing, and study space (Oliveira et al., 2021). The need to expand and modernize library infrastructure to accommodate both physical and digital users is thus imperative.

The overarching tone in the responses suggests a strong institutional commitment to enhancing the library's role in blended learning. The librarians noted that the university is "continually working to improve bandwidth, increase access points, and expand digital collections." This commitment is in line with recent findings by Ifijeh & Yusuf (2020), who argue that academic libraries must reposition themselves as strategic partners in digital education. The proactive steps to upgrade both digital and physical facilities underscore a recognition of the library's central role in pedagogical innovation. The above themes reflect a hybrid environment in transition—marked by growing digital capacity, infrastructural bottlenecks, overburdened physical resources, and institutional will to support change. While progress is evident, bridging the gap between resource availability and actual usage—especially for remote learners—remains a critical concern.

The responses from university librarians regarding strategies to ensure timely updates and accessibility of e-books, e-journals, and other digital resources reveal several consistent and significant themes. A key strategy emphasized is close collaboration with publishers and vendors, as reflected in statements like "the library works with vendors to subscribe to databases and e-journals" and "maintains close communication with publishers··· to ensure timely acquisition." Vendor partnerships facilitate timely updates, license negotiations, and access to the most current academic content. Libraries at the University of Embu engage in continuous evaluation of their digital resources, reviewing subscriptions "based on user demand, usage statistics, and academic programs offered." This iterative process ensures that digital collections remain aligned with institutional priorities and user needs. Manual updates are also conducted periodically. Efforts to improve access mechanisms are prominent, with initiatives such as the use of MyLOFT enabling "students and faculty to access digital resources anytime, anywhere using a single login." Enhancing the library's website and authentication systems was also noted. This reflects the growing need for seamless and remote access to digital content, particularly in blended and distance learning contexts.

Another noteworthy strategy is the integration of updated e-resource links into the Learning Management System (LMS) and library website. This ensures that users can easily discover and access content relevant to their courses. The alignment of library services with institutional e-learning platforms is a recommended practice for promoting engagement and resource visibility such integration simplifies user experience and enhances the educational impact of digital library resources.

While some responses noted "limited online training and guides," others highlighted regular training efforts to help users discover and utilize resources. The provision of user training, feedback mechanisms, and guides enhances digital literacy and supports informed resource use. Engaging users in feedback processes also strengthens collection development strategies. As observed by Adu & Ngulube (2017), training programs and participatory feedback loops improve user satisfaction and the overall effectiveness of digital library services.

Their responses show that the university library actively encourages the downloading of e-books, articles, and guides for offline use, a crucial measure for students in areas with limited or unreliable internet. As one response noted, "the library encourages downloading of e-books, articles, and research guides for offline reading." Offline access aligns with global trends where educational institutions in low-bandwidth settings adopt downloadable resources to ensure equity. Offline access minimizes dependency on continuous internet connectivity and enables continued learning in infrastructure-poor settings.

Several responses emphasized efforts to enhance access via smartphones, recognizing that many students lack laptops or desktop computers. The library's adoption of mobile-responsive digital platforms is key to reaching learners in remote regions.

The library is also exploring device loan schemes in collaboration with ICT departments to provide hardware to students who cannot afford their own. Although these programs are "still in the early stages," they signal an inclusive approach to digital resource access. Device provision initiatives are increasingly being adopted by universities to promote educational continuity, particularly during and after the COVID-19 pandemic (Agu et al., 2021). Such efforts are critical in addressing structural inequalities in digital access.

The library offers virtual training sessions and recorded tutorials to build students' digital competencies, especially those with limited technical skills. In addition, librarians provide support through WhatsApp, email, SMS, and phone calls, ensuring students receive help regardless of their connectivity or geographic limitations. These multiple touchpoints reflect best practices in learner support, as emphasized by Chawinga & Zinn (2019), who noted that effective library outreach in African institutions requires both digital and non-digital communication strategies to reach the widest audience.

Librarians also emphasized ongoing efforts to strengthen digital infrastructure, including the use of platforms like MyLOFT, which enables access to e-resources with minimal bandwidth. One response noted the goal of creating "a more robust digital infrastructure" to support off-campus access. Investments in such platforms help reduce the technological friction faced by underserved students and are consistent with recent findings by Sigama & Kalema (2022), who underscore the importance of bandwidth-efficient digital tools in sub-Saharan educational contexts. The University of Embu's library demonstrates a clear understanding of the contextual challenges facing remote and underserved learners and has implemented a responsive set of strategies to address them.

The study also engaged members of faculty in an interview. Therefore, a question was posed to respondent requiring them to explain how the availability (or lack) of electronic and open-access resources impact your ability to effectively deliver blended learning. Faculty members reported that the limited availability of e-resources, particularly subject-specific materials, "makes it harder to give students enough materials online" and "limits what we can share with students online."

While some free or open-access resources are helpful, they do not adequately cover all disciplines. This reflects a broader challenge faced by many universities in the Global South, where institutional subscriptions may not align with curriculum needs across diverse fields.

In adequate robust electronic content has led to an "overreliance on print materials," which is problematic in a blended learning environment where online delivery is crucial. This challenge affects not only flexibility in teaching but also student access, especially for those in remote or underserved areas. According to one faculty member, "students rely too much on print materials," which can be inaccessible to off-campus learners during peak periods or emergencies.

Studies such as Buckenmeyer et al. (2016), highlight that blended learning thrives when digital content is easily accessible, interactive, and tailored to course outcomes. Without sufficient digital resources, blended models default to traditional methods, thereby undermining the core benefits of blended learning such as flexibility, inclusivity, and continuous access. The effectiveness of blended learning at the University of Embu is significantly impacted by the limited availability of comprehensive and subject-specific electronic and open-access resources. This limitation constrains faculty efforts to deliver diverse and accessible course materials online and forces a continued dependence on print resources.

There was finally interested in finding out what improvements were needed regarding the acquisition, accessibility, or usability of information resources for blended learning? Views were sought from responses from university librarians, library staff and postgraduate students. Four themes were as discussed below. All respondent groups emphasized the need for more online databases, current e-books, and subject-specific journals, particularly in underrepresented areas such as social sciences and humanities. A postgraduate student noted the need to "increase the number of current e-books and journals related to my field of study," while a faculty member stressed the need to "get more online databases and e-books."

This call aligns with findings by Moore & Reinsfelder (2020), who observed that content diversity and relevance are central to students' and faculty's satisfaction with library e-resources in blended environments. Additionally, multimedia resources including videos, podcasts, and interactive tutorials were highlighted as essential, especially for engaging different learning styles. The inclusion of multimedia tools has been shown to improve learner retention and engagement in blended contexts (Kebritchi et al., 2017).

Library staff and faculty both noted the need for improved off-campus access, stable internet, and remote access infrastructure to ensure equitable 24/7 availability. This includes investments in platforms like proxy servers or cloud-based access systems that can operate under limited bandwidth. As one librarian emphasized, there is a need to "strengthen remote access infrastructure for reliable 24/7 access."

Another key theme is the need for frequent digital literacy training for both faculty and students. As highlighted by one librarian, there should be regular "training on how to navigate and utilize digital resources." This sentiment is echoed by faculty members calling for guides on how to use databases. Digital literacy is a critical success factor in blended learning environments. According to Alzahrani & Seth (2021), students' ability to navigate and utilize e-resources directly influences their academic performance in blended learning setups. Training also supports equity by helping

less digitally confident users make effective use of available resources.

Postgraduate students highlighted the need for a more user-friendly and intuitive library website. The call to “make the library website more user-friendly and easier to navigate remotely” underscores usability concerns that can impede access to valuable resources. Similarly, the need for well-organized open-access resources reflects a desire for better curation and discoverability.

4.2.4 Convergence of quantitative and qualitative findings on library resources

A significant point of convergence lies in the area of digital resource collection adequacy and the perceived need for expansion and diversification. Quantitatively, library staff reported high levels of agreement regarding the sufficiency of e-books, e-journals, and digital resources (Mean = 4.15, SD = 0.821), and postgraduate students similarly reported high agreement on the sufficiency of electronic resources to support coursework and research (Mean = 4.14, SD = 0.806). However, qualitative insights from university librarians reveal that while digital resources are considered "relatively adequate and continue to grow," they are also acknowledged as "somewhat limited compared to larger institutions," often due to budget constraints. This limitation is echoed by faculty members, who reported that the limited availability, particularly of subject-specific materials, "makes it harder to give students enough materials online" and "limits what we can share with students online". Converging views expressed as needed improvements across respondent groups explicitly call for more online databases, current e-books, and subject-specific journals, highlighting specific areas like social sciences and humanities as underrepresented. This collective perspective underscores that despite a general positive quantitative perception of existing resources, there is a strong qualitative and explicit quantitative (in the needed improvements section) consensus on the necessity for enhancing the scope and relevance of digital collections.

Another key area of convergence involves remote access reliability and the challenges related to underlying technical infrastructure. Both library staff and postgraduate students reported very high levels of satisfaction with remote access to library resources, with staff rating it as well-supported and reliable (Mean = 4.38, SD = 0.604) and students affirming they can access resources remotely without major challenges (Mean = 4.27, SD = 0.577). This quantitative data suggests a successful implementation of remote access mechanisms. However, qualitative responses from university librarians highlight "inconsistent access to digital platforms" stemming from "technical problems and internet bandwidth constraints," noting that inadequate internet speed and limited access devices exacerbate these issues.

Faculty members also observed that the lack of robust electronic content contributes to an "overreliance on print materials," which is "problematic in a blended learning environment" and inaccessible to off-campus learners. The call for improvements aligns these perspectives, with library staff, faculty, and librarians emphasizing the need to strengthen remote access infrastructure for reliable 24/7 access, improve stable internet connectivity, and invest in platforms that operate under limited bandwidth. This convergence indicates that while users perceive the remote access system as generally functional, those managing and experiencing specific limitations acknowledge significant infrastructural bottlenecks that require ongoing investment and improvement to ensure consistent

and equitable access.

The usability, organization, and discoverability of digital resources also emerged as a converging theme. Quantitatively, both staff (Mean = 4.21, SD = 0.729) and students (Mean = 4.18, SD = 0.726) rated open-access materials positively regarding their curation and accessibility. Qualitatively, university librarians are actively engaged in curating open-access resources and implementing strategies to improve access mechanisms through platforms like MyLOFT, enhancing the library website, and integrating resource links into the LMS. However, postgraduate students specifically identified the need for a more user-friendly and intuitive library website for remote navigation and called for better curation of open-access resources to improve discoverability. Faculty also noted that even helpful free/open-access resources do not adequately cover all disciplines and that gaps remain in discipline-specific coverage. These points converge on the understanding that while digital resources, including open access, are present and generally rated well for basic accessibility, there is a shared recognition of the need for improved user interface design, better organization, and enhanced discoverability to maximize their utility for users.

The perceived value and utility of multimedia resources represent a clear area of convergence. Postgraduate students overwhelmingly reported multimedia resources as useful in their studies, with the highest mean score among the items they rated (Mean = 4.36, SD = 0.604). Library staff also rated multimedia resources as adequate to support blended learning courses with high agreement (Mean = 4.03, SD = 0.904). Furthermore, members of faculty, when discussing needed improvements, explicitly highlighted multimedia resources as essential for engaging different learning styles. This alignment across student, staff, and faculty perspectives demonstrates a strong consensus on the positive impact and necessity of incorporating multimedia content into library collections for blended learning.

Finally, the practice of regularly updating digital collections is a point of convergence in perception and strategy. Both library staff (Mean = 4.26, SD = 0.618) and postgraduate students (Mean = 4.25, SD = 0.621) reported high agreement that digital collections are regularly updated. University librarians outlined their strategies for ensuring timely updates, including collaboration with publishers/vendors and continuous evaluation based on user demand and academic programs. This convergence indicates that libraries are perceived by users as actively maintaining their digital content and that librarians are indeed prioritizing these updates, recognizing their importance for meeting evolving academic needs.

5. Conclusion and Implications

University administration, in close collaboration with libraries and ICT departments, should prioritize significant and sustained investment in expanding and diversifying digital collections, strategically acquiring subject-specific online databases, current e-books, and multimedia resources to address identified content gaps and cater to varied learning preferences. Paramount is the urgent necessity to upgrade underlying technical infrastructure to ensure robust, reliable, and high-bandwidth remote access, while also implementing technical solutions optimized for bandwidth-constrained environments

to guarantee equitable 24/7 accessibility for all learners, particularly those off-campus. Libraries should concurrently proactively improve the usability and discoverability of digital resources through enhanced library website design for intuitive remote navigation and systematic curation of open-access materials, alongside addressing digital accessibility for users with disabilities through the adoption of universal design principles and investment in assistive technologies. Finally, deliberate measures are required to ensure the effective integration and complementarity of print and digital resources to eliminate reliance barriers for remote learners, supported by consistent and comprehensive digital literacy training for both students and faculty to maximize the effective utilization of available resources, thereby ensuring that library services are fully optimized to support the demands of modern blended learning pedagogy.

According to the findings, Universities will need to strategically spend on upgrading and expanding the digital infrastructure, which means that the University Administration, Libraries, and ICT Departments will have to work in co-ordination in order to increase Wi-Fi reliability and speed, digital learning space, improve the remote access system, and deal with the unpredictable student access to the digital devices with potential subsidy or access schemes. At the same time, it is recommended that Libraries and Academic Departments institutionalize strong cooperation by requiring joint planning sessions and joint development of integrated resources and training programs in order to overcome the existing lack of collaboration and align resources to pedagogical requirements.

Statements and Declarations

Author Contributions: John Kinyua Ndege: Led the development of the study, research design, data collection, data analysis, and interpretation of findings. He also contributed to the revision and editing of the initial manuscript. Dr. Anne Mugalavai: Contributed to the literature review and methodology, and critically reviewed the manuscript. Dr. James Ndwiga: Provided scholarly guidance and contributed to the review and editing of the manuscript.

Institutional Review Board Statement: Permission to conduct the research was obtained from the National Commission for Science, Technology and Innovation (NACOSTI), Kenya. Research authorization was also obtained from the respective universities where the study was conducted.

Informed Consent Statement: Consent was obtained from all participants before data collection. Participation was voluntary, and confidentiality of the information provided was maintained.

Funding: This research received no external funding.

Data Availability Statement: Available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare no conflict of interest.

Generative AI Use Statement: No generative AI tools were used.

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