Evidence Based Library and Information Practice

Re-Purposing the Physical Space of an Academic Library in the Digital Era: A Case Study of Jawaharlal Nehru University and Delhi University, New Delhi (India)

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Article abstract

Objectives – The issue/return of books and other reading materials available on shelves in academic libraries has declined. Round-the-clock availability of information resources, high-speed internet, cheaper cost of data download, laptops, and smartphones are some of the reasons behind decreased usage of print reading materials. Users are spending more time studying, accessing e-resources, socializing with friends, and discussing with peer groups in the library building. Libraries in developed countries have already recognized the need of the hour and redesigned their spaces to create a variety of reading spaces, creative spaces, quiet spaces, and so forth in the existing building. But the libraries of the higher education institutions in India have not considered the users' needs concerning the library space. No such study has been conducted at large universities in India. This study was conducted with library users of the central library of two large universities located in New Delhi to find users' opinions and views to re-purpose the library space to meet users' needs.

Methods – The survey method has been used to understand the use of the existing format of knowledge resources and the need of library users. The central point of the research questionnaire is to optimize the library space of the central libraries of the universities under study. Printed questionnaires were distributed to the users present in the reading halls of the libraries at Jawaharlal Nehru University (JNU), New Delhi, and Delhi University (DU), New Delhi, and online questionnaires were distributed to faculty members. The collected data were analyzed with Microsoft Excel, and various hypotheses were tested using non-parametric tests such as the sign test, Mann-Whitney U test, and Kruskal-Wallis test.

Results – Students and research scholars visit daily and spend more than four hours in the library building. They use their time in study, accessing e-resources in the reading halls of the library more than any other place. The users opined the reading halls should have wi-fi facilities, a power source to charge laptops and mobile phones, washrooms near every reading hall, a quiet reading space, and a clean ambient environment for long hours of study in the library building.

Conclusion – Library users in the 21st century want more physical space to study, concentrate, socialize, and learn in the informal learning environment. They need library space with the latest infrastructure to connect to the digital world to retrieve study materials and print copies of study materials. Educational institutions should create more varied reading spaces for serious reading, pleasure reading, in-depth reading, and interactive learning spaces in new library buildings.

Evidence Based Library and Information Practice

Research Article

Re-Purposing the Physical Space of An Academic Library in the Digital Era: A Case Study of Jawaharlal Nehru University and Delhi University, New Delhi (India)

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Introduction

Every profession operates according to certain principles. Libraries operate on the principle of the five laws of Library Science as defined by Dr. S.R. Ranganathan (1931):

- **First Law:** Books are for use.
- **Second Law:** Every book has its reader.
- **Third Law:** Every reader has his/her books.
- **Fourth Law:** Save the time of the reader.
- **Fifth Law:** The library is a growing organism.

Zabel (2005) explained that all five laws are still relevant in the digital age. Zabel advocated that the fifth law of Library Science, "The library is a growing organism," implies that libraries should always change their space (2005, p.24). Many libraries are changing their spaces to information commons. *Information commons* means a space in the library building where library staff provide information services, and where library users can visit and receive help from library staff with regard to basic computer knowledge, electronic resources, and other tools.

Over a period of time, the collection reaches the physical capacity of the academic library. To manage the collection within limited physical space, libraries adopt the policy of weeding out the least used materials from the collection.

The objectives of the library are to collect, organize, store, and disseminate knowledge resources. But, in the last two decades, libraries are witnessing a revolutionary change in the availability and accessibility of knowledge resources. Information is ubiquitous. Nowadays library users can access information through their mobile phones, iPads, laptops, and other handheld electronic equipment anytime and anywhere around the clock. Sources such as Project Gutenberg, Internet Archive, Open Library, Google Books, HathiTrust Digital Library, NDLTD (Networked Digital Library of Theses and Dissertations), Google Scholar, and others are the platforms from which library users are accessing many electronic books and scholarly electronic journals for their academic use. Besides this, the libraries of higher education institutions in India, like universities and technical institutions, are subscribing to many online databases of journals and e-books for their users through library consortia and from their funds.

Users can access academic resources around the clock across campus, barring the restriction of access to knowledge resources from 9 a.m. to 6 p.m. only as in the case of a traditional library. There is no need to visit the library building to access electronic resources. The reading contents of the library are now replaced with e-resources, leading to fewer visits from library users in the physical library and lower circulation statistics.

The deserted libraries of the nineties are now the happening places on campuses. Libraries are converting themselves into learning resource centres. The role of the librarian has also changed from custodian of books to information facilitator. This study is an attempt to explore the usage of the library space including the reading halls of two major universities of India located in New Delhi. The output of the study may be implemented in other academic libraries as the type of collection and information-seeking behaviour of users in academic libraries across the world are similar.

Literature Review

This literature review presents the developments, challenges, and issues related to renovation of the physical space in libraries across the world, as discussed in literature published after 2008. The investigators primarily focused on literature addressing how the usage of e-resources has impacted the use of library space, how libraries redesigned their reading space to meet users' needs, and whether physical visits by library users increased after the renovation of physical libraries throughout the world.

Musoke (2008) and Kathleen et al. (2019) studied users' information-seeking behavior at the Universities of Makerere and Dayton. According to them, the library is the largest non-classroom and non-residential building on the campus, where students concentrate in a non-distracting and pleasant environment. The library provides comfort and a quiet reading space for study. Many users prefer to study alone rather than in a group. Academic library buildings are now repurposing their reading space as learning spaces, collaborative spaces, group study rooms, and instructional spaces to attract more students. Freeman (2005) observed, "The library is the only centralized location where new and emerging information technologies can be combined with traditional knowledge resources in a user-focused, service-rich environment that supports today's social and educational patterns of learning, teaching, and research" (2005, p. 4). Applegate (2009) wrote, "The library is a campus space, one uniquely suited to meet important student needs for space as well as services and resources. Where will students do what they need to do? Where will they read? Plug in their laptops? Eat and drink? Talk with their classmates and friends—and not have to listen to other people talking? Have a place to concentrate in quiet?" (2009, p. 345). Gayton (2008) argues that there is a decline in the circulation of print books, reduced number of reference materials, and falling gate counts in the academic library. There is a demand for café space, group study rooms, and information commons in the library. Applegate (2009), Gibson and Kaplan

(2017), Hall and Kapa (2015), Hillman (2017) and Norton et al. (2013) reported that students have diverse desires for library spaces, such as quiet reading spaces, group study rooms, research scholars' carrels, and coffee shops. Many visit the library to use computers and printers. After the renovation of the physical space, the gate counts increased by 15% (Hilman, 2017). Hall and Kapa (2015) found that 84% of users visit the library to use the quiet space.

Cheong et al. (2016), Hegde et al. (2018), Ozburn et al. (2020), and Stemmer et al. (2019) concluded that library users need various types of space during different times of day and periods of the year. Based on their need, spaces can be categorized into four types, namely collaborative space, sanctuary space, interaction space, and community space. Collaborative spaces are being developed for different types of intellectual work, presentation practice, discussion, social interactions, and peer learning; these spaces can be noisy. The sanctuary space is for quiet reading. Andrews et al. (2016) observed users prefer large-screen LCD, headphones, screen-sharing software, couches, bean chairs, chairs with mobility in reading halls, and 3D printers. Spencer & Watstein, (2017) found users need noise acoustic-designed carpeted floors in reading areas. Hin et al. (2018) explained that libraries are now changing into proactive learning centres and cultural centres of universities. Chaddha and Kanjilal (2022) concluded that library users are not satisfied with library space and time of operation, but with a few modifications of the existing library building and incorporation of new furniture, small academic libraries can create information commons that will satisfy users.

It is evident from this literature review that libraries in the western part of the world have renovated their physical space to welcome the library users to spend more time and engage themselves in study and discussion. They have refurbished library spaces to meet the different reading needs of users like group study rooms, individual study rooms, quiet study rooms, discussion rooms with whiteboards, big screens for presentations, and more. The literature also showed increases in the post-renovation occupancy of library reading space and gate count. Authors all report that users need quiet space and different types of study space for different purposes. The role of the physical library has changed from physical collections to informal learning centres where users can concentrate, study, socialize with friends, discuss academic matters, access e-resources, and others. Users have varied learning behavior, and space assessment and redesign are done according to their needs.

Literature shows that library users prefer a variety of reading spaces in the library to use at different times of the day and year, and usage of reading space increased when interior renovations took place. A 2022 study conducted in India reveals that library users need quiet space and collaborative space where information experts can help them in using information technology to enhance their learning (Chadda & Kanjilal, 2022). However, no study has been conducted in India to assess the academic library space and its usage after the introduction of e-resources in large academic libraries. This study aims to find out users' needs concerning reading space and optimization of existing reading halls of libraries of large universities in New Delhi, India.

Aims

Indian universities are opening more schools of study to meet the needs and demands of the society and market. As a result, more faculty members and students are joining universities. Due to lack of funds, academic libraries are not expanding their buildings for storage. Print collections grow with time, with archive issues of research journals, theses, and dissertations occupying significant shelf space. There is no standard weeding policy to shift the least used materials from library buildings, and there is no annex to store obsolete materials. Meanwhile the increased number of physical users requires more seating space

in reading halls to study and access the e-resources through their devices, while libraries have not added any more space in the existing building since establishment.

Objectives

The objective of this study is to bridge the expectation of users concerning the collections and infrastructure of libraries. This study will assist librarians in developing and South Asian countries in redesigning their libraries to optimize the physical space and other resources to meet users' satisfaction and the mandate of the university.

Research Questions

The research will attempt to answer the following questions:

RQ1. When e-resources are available anywhere and anytime, why do users visit the library building?

RQ2. How do we optimize the existing physical space of the library building by weeding print journals and theses or shifting them to a remote location to accommodate more library users?

RQ3. Which locations do library users visit during their stay in the library building, and how much time in a day do they spend in the library?

RQ4. What infrastructure is required in the library reading space for various activities such as serious reading, leisure reading, quiet study, group study, and socializing with friends?

Hypotheses

Hypothesis testing is the use of statistics to test whether a given hypothesis is true or not. In this study, we formulate the following sets of hypotheses:

Null Hypothesis (H_{01}): The visitors are not interested in the physical space being optimized with the latest tools and infrastructure.

Alternative Hypothesis (H_{11}): The visitors are interested in the physical space being optimized with the latest tools and infrastructure.

Null Hypothesis (H_{02}): There are no significant differences among user groups in their opinions regarding whether to optimize the library space.

Alternative Hypothesis (H_{12}): There are significant differences among user groups in their opinions regarding whether to optimize the library space.

Research Methodology

Study Participants

The present study selected two central universities, Jawaharlal Nehru University (JNU) and Delhi University (DU), both located in New Delhi, India. Participants of the study are the

Undergraduate/Postgraduate (UG/PG) students, research scholars, and faculty members of these universities. JNU is a single campus university, whereas DU has two campuses: North Campus and South Campus. DU has 91 constituent colleges. JNU has granted recognition and accreditation to over 18 defence and research and development institutions.

Jawaharlal Nehru University (JNU) comprises 13 schools, 55 centres, and 7 special centres. The university imparts education at UG, PG, M. Phil., Ph.D., and Post-Doctoral levels. Recently the university has added management and engineering courses. There are around 4000 registered library users. Average library traffic is around 500-800 users per day. The footfall increases during new admission and term-end examination (JNU, Annual Report, 2018).

Delhi University (DU), one of the largest universities in India, has 87 departments, 16 centres, and 90 colleges. Each college or centre has its own library. The present study surveyed the users present in the Central Library during the researchers' visit. The researchers visited the library for 3 days consecutively during the mid-term. The central library of DU has around 4200 registered users and the daily footfall varies from 400-800 users per day. (DU, Annual Report, 2018).

The sample population of the study includes UG/PG students, research scholars, and faculty members of the university who are registered as library users in the central library of the north campus of DU and the central library of JNU. Although faculty members rarely visit the library, their responses as stakeholders of the library are also important in the study. Here *faculty members* are those engaged in teaching and research activities in the discipline, whereas the *research scholars* are the students who are enrolled as M. Phil. (Master of Philosophy) or Ph.D. (Doctorate of Philosophy) students.

Sampling Technique

It is practically impossible to collect the data from all registered library users therefore the investigators collected the data from the group of users who were easy to contact or easy to reach (convenience sampling). The central point of the study is related to optimization of the physical space of the library in the present era, and therefore the views and opinions of the library users who visit the library make more sense than casual users or students who hardly visit the library. The investigators visited the central library of JNU and the central library of the north campus of DU consecutively for 3 days from 10 a.m. to 7 p.m. and distributed printed questionnaires to the library users present in the library premises. An online questionnaire, designed in Google Forms, was sent to faculty members whose e-mail addresses were available on the university faculty directory website.

Instrument and Procedures

A questionnaire was used as the instrument for data collection, and Microsoft Excel was used to analyze the data. The questionnaire (Appendix A) was designed by the investigators based on the literature review and the local condition of the libraries; it consists of demographic variables, frequency of visit, preference of format of reading materials, preference of physical space, weeding of least used reading materials, and preference of infrastructure in the physical space. Statements are rated based on users' preferences like "Yes" and "No." For opinions about the optimization of physical space in the library, 4-point scales were used with ratings ranging from 1 ("Can't say") to 4 ("Must"). Rank 4 is highest, meaning the visitor significantly wants to optimize the physical space and the library should redesign and develop the physical space into a learner-centric library.

At the pilot level, the questionnaire was distributed among 30 respondents, both library users and library staff, to collect their suggestions and views about any ambiguity and clarity in the questionnaire. Then the questionnaire was modified according to feedback received during the pilot study. The questionnaire has both open and closed-ended questions. With each question, space was provided for respondents to give suggestions.

Data Collection Method

The investigators visited the central library of JNU and the central library of the north campus of DU consecutively for 3 days from 10 a.m. to 7 p.m. They distributed printed questionnaires to the library users present in the library premises. An online questionnaire, designed in Google Forms, was sent to the faculty members whose e-mail addresses were available on the university faculty directory website.

Data Analysis Tool Used

Microsoft Excel was used to code the ordinal data and numerical calculations. Most data collected was in the form of an ordinal scale, so median and quartile deviation (QD) was used to summarize the data, and non-parametric tests such as the sign test, Mann-Whitney U test, and Kruskal-Wallis test were used to test the different types of hypotheses.

Results

The printed questionnaires were distributed to UG/PG students and research scholars and emailed to the faculty members; the numbers of responses are summarized in Table 1.

Table 1
Responses to the Distributed Questionnaires

Name of the University	No. of the questionnaires distributed	Responses of the UG/PG students (% of response)	Responses of the research scholars (% of response)	Responses of the faculty members (% of response)	Total
JNU	1600	220/500 (44%)	220/500 (44%)	211/600 (35%)	651/1600 (40.68%)
DU	1600	100/500 (20%)	205/500 (41%)	167/600 (27%)	472/1600 (29.5%)
Total	3200	320/1000 (32%)	425/1000 (42.5%)	378/1200 (31.5%)	1123/3200 (35.09%)

From Table 1, we observe the response rate of UG/PG students is 32%, research scholars 42.5%, and faculty members 31.5%.

Frequency of Visits

UG/PG students, research scholars, and faculty members visit their library when they need to collect/refer to books, journals, and other reference materials from the library. The frequency of visits varies among different types of users. Based on the responses received, the survey shows that more than 72% of 320 UG/PG students and 71% of 425 research scholars visit the library daily, versus only 4% of 378 faculty members. Twenty percent and 19% of the faculty members visit once a month and once in a quarter. Twenty-three percent of the UG/PG students and 13% of research scholars visit 2-3 times a week. Eighteen percent of faculty members visit 2-3 times a week. Twenty-eight percent of the faculty members did not respond. Figure 1 shows the frequency of visits to the libraries in JNU and DU.

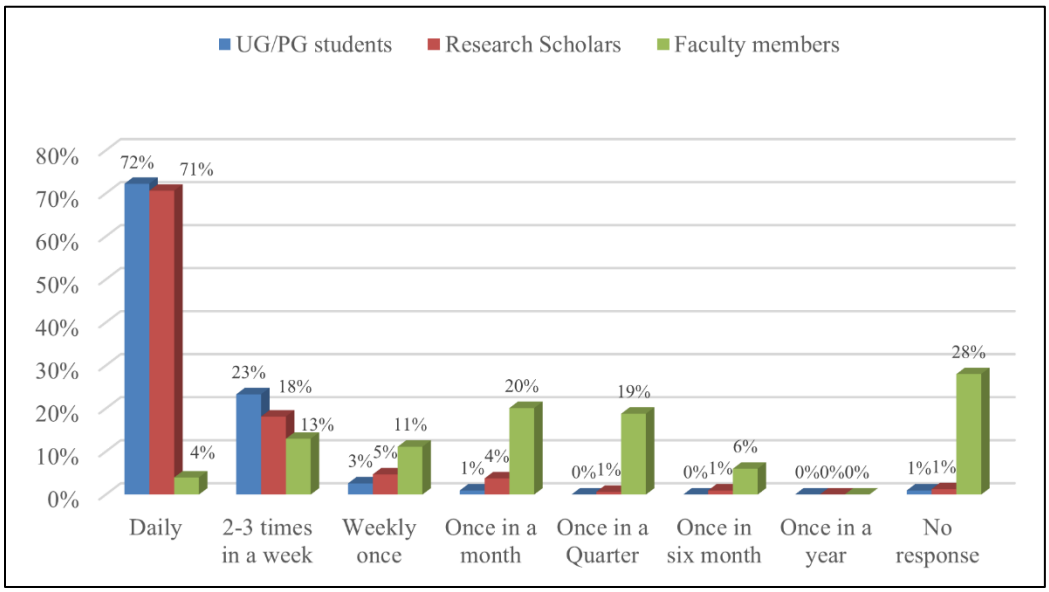


Figure 1
Frequency of library visits.

Time of Stay in the Library Building

More than 60% of the UG/PG students and research scholars spend more than four hours in the library building whenever they visit the library. Only 2% of the faculty members spend more than four hours. Figure 2 presents the time in hours stayed by the visitors in the library building.

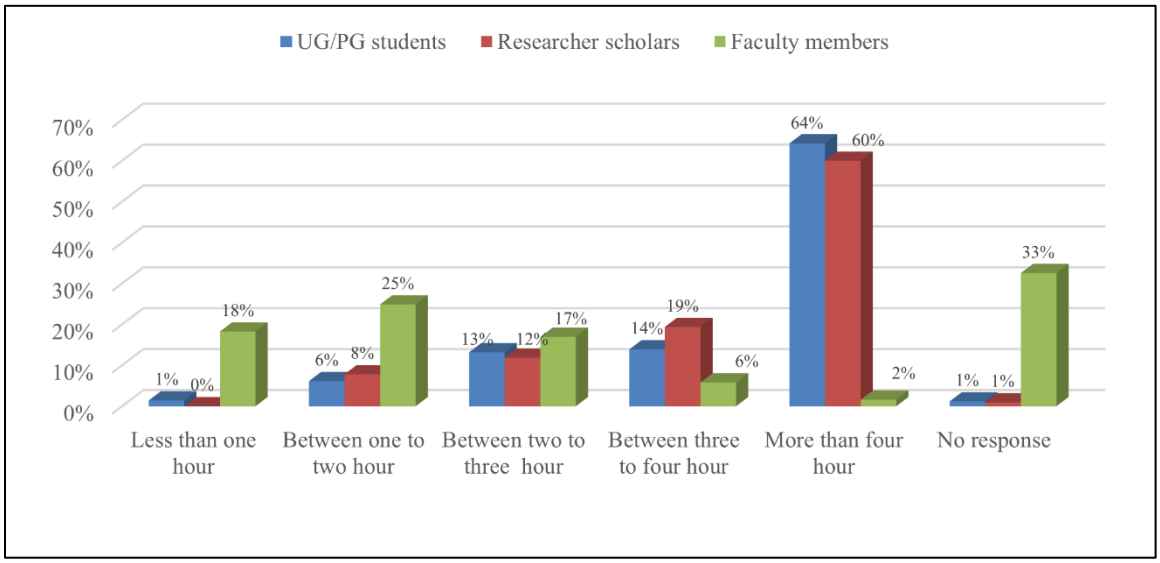
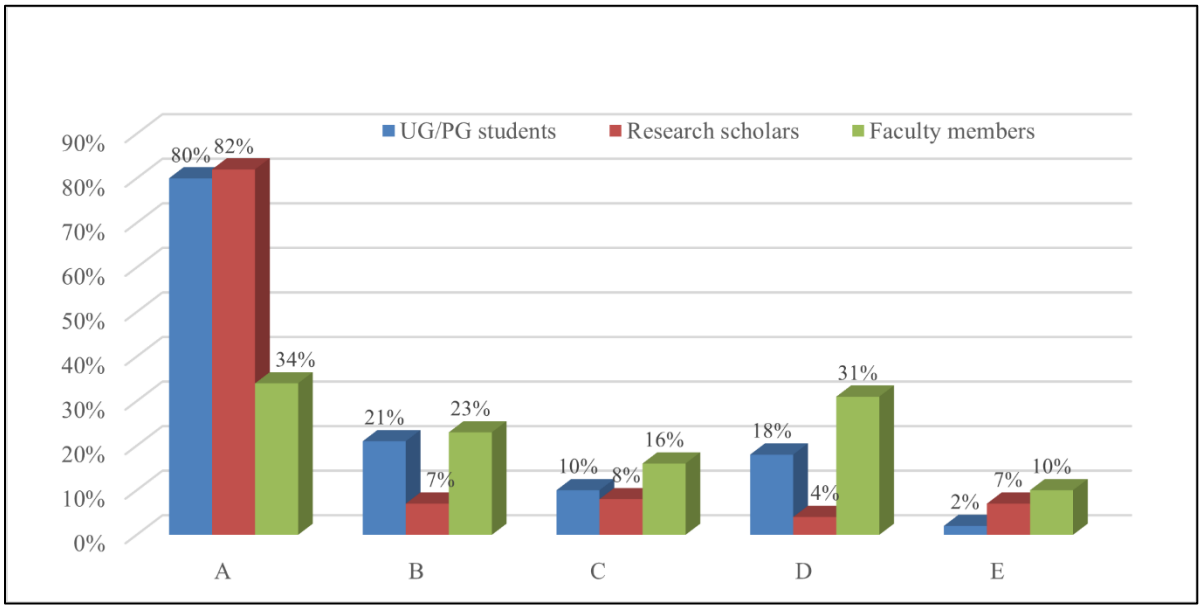


Figure 2
Time of stay in the library building.

Library Premises Visited

Eighty percent of UG/PG students and 82% of research scholars visit the reading hall of the library most of the time, where they read, write, access e-resources, prepare for exams, prepare notes, and other academic purposes. They visit other areas like book stacks, reference collections, periodical sections, bound volumes, and Ph.D. theses "sometimes." Thirty-four percent of faculty members also visit the reading hall of the library most of the time. Figure 3 indicates the areas of the library visited by the visitors most of the time.

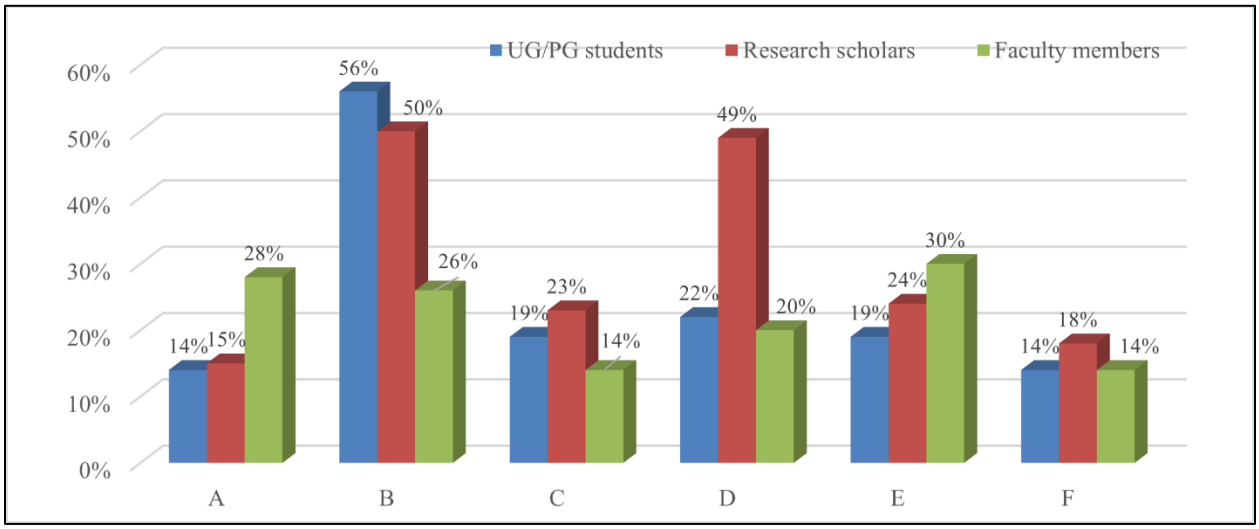


A- Reading hall with tables, chairs, and charging points for laptops, **B**- Stack areas in which books and textbooks are stocked, **C**- Reference collection section, **D**- Periodical section, **E**- Bound volume/ theses/ dissertation section

Figure 3
Premises visited by library visitors in the building.

Purpose of Visit

Figure 4 shows the purpose of the visitors visiting the library. Fifty-six percent of UG/PG students and 50% of research scholars visit to study in the reading hall more than any other purposes. Twenty-six percent of faculty members visit the library to use the reading hall, and 30% of them visit to browse print journals and magazines. Lower percentages of all user groups visit to reference back volumes of print journals and theses.



A- Issue/Return of books; **B**- Study in reading hall; **C**- To access e-resources using desktops; **D**- To access e-resources using a personal laptop; **E**- Browsing print journals & magazines; **F**- To refer back vol journals and Ph.D. theses.

Figure 4
Purpose of visit to the library by visitors (most of the time).

Re-Purposing the Reading Space

Data was analysed to compare visitors' opinions of the libraries concerning the optimization of physical space. Since the data is collected on the ordinal scale, the investigators have calculated the descriptive statistics median and quartile deviation in the following table.

Table 2
Redesign Library Interior for a Variety of Reading Spaces (Overall Views)

S. No.	Attributes	Can't say	Not Required	Desirable	Must	Total	Median	QD
		1	2	3	4			
A	Large table study room with a whiteboard	42	224	420	437	1123	3	1
		4%	20%	37%	39%			
B	Group study room with large table, whiteboard, and LED screen for presentation practice, seminar talk with the peer group, etc.	41	182	474	426	1123	3	1
		4%	16%	42%	38%			
C	Makers space with facilities like 3D printers for creativity, video and audio capture, large format printing, art-related workshops, music recording spaces, and so forth	100	212	468	343	1123	3	2
		9%	19%	42%	31%			
D	Smart classroom with movable chairs, cozy bean chair, interactive screen, whiteboard, interactive digital wall, and projector	73	237	424	389	1123	3	2
		7%	21%	38%	35%			
E	Standing workstation	150	151	479	343	1123	3	2
		13%	13%	43%	31%			
F	Carrels for research scholars	115	55	424	529	1123	3	1
		10%	5%	38%	47%			
G	Faculty study room with wi-fi facility	69	48	322	684	1123	4	1
		6%	4%	29%	61%			
H	Quiet study room	7	29	193	894	1123	4	0
		1%	3%	17%	80%			
I	Non-silent zone for attending mobile calls and socializing with friends	71	320	338	394	1123	3	2
		6%	28%	30%	35%			
J	Open space: A variety of study spaces accommodating individual, small group, and large group study	36	115	554	418	1123	3	1
		3%	10%	49%	37%			
K	Seminar room with 10-20 people seating capacity with whiteboard, chalkboard, and presentation display	69	137	517	400	1123	3	1
		6%	12%	46%	36%			
L	Web conference room with Polycom conference phone and technology	110	191	446	376	1123	3	2
		10%	17%	40%	33%			

M	Presentation room with the microphone	100	210	435	378	1123	3	2
		9%	19%	39%	34%			
N	Living room seating with chairs and small tables with large monitors for laptop hook up	92	200	469	362	1123	3	2
		8%	18%	42%	32%			
O	Coffee dispensing machine near every reading hall	71	238	358	456	1123	3	2
		6%	21%	32%	41%			
P	Small table with a chair near a glass window for natural light reading	53	100	473	497	1123	3	1
		5%	9%	42%	44%			
	Overall	**7%**	**15%**	**38%**	**41%**		**3.125**	**1.43**

Table 2 reveals that 7% of all visitors (including UG/PG students, research scholars, and faculty members), opined "cannot say" about the redesign of the library interior for a variety of reading spaces, 15% of them said that these were "not required," while 79% of them suggested optimizing the physical space of the library with latest tools and infrastructure. The overall average score of all visitors about the optimization of the physical space is 3.125 which represents the rating between "Desirable" and "Must." Hence, this study indicates that visitors wish to optimize the physical space of the library to be learner-centric.

To validate the results, hypothesis testing was used. A hypothesis was formulated that visitors are interested in the physical space being optimized with the latest tools and infrastructure. Scores of 3 and 4 (Desirable and Must) would represent that visitors are interested in optimizing the physical space; therefore, we test whether the overall average is 3 or more. Since the data is on an ordinal scale, the non-parametric sign test is used instead of the one-sample t-test.

The results of the test presented in Table 3 indicate the p-value (0.022) is less than the level of significance (0.05); therefore, the null hypothesis is rejected, and the researchers conclude that visitors are interested in the physical space being optimized with the latest tools and infrastructure.

Table 3
Results of One-Sample Sign Test

Groups	**Sample Size**	**Test Statistics**		**Conclusion**
All visitors	1123	S	123	**p< 0.05**
		Z	–1.144	
		p	0.022	Significant

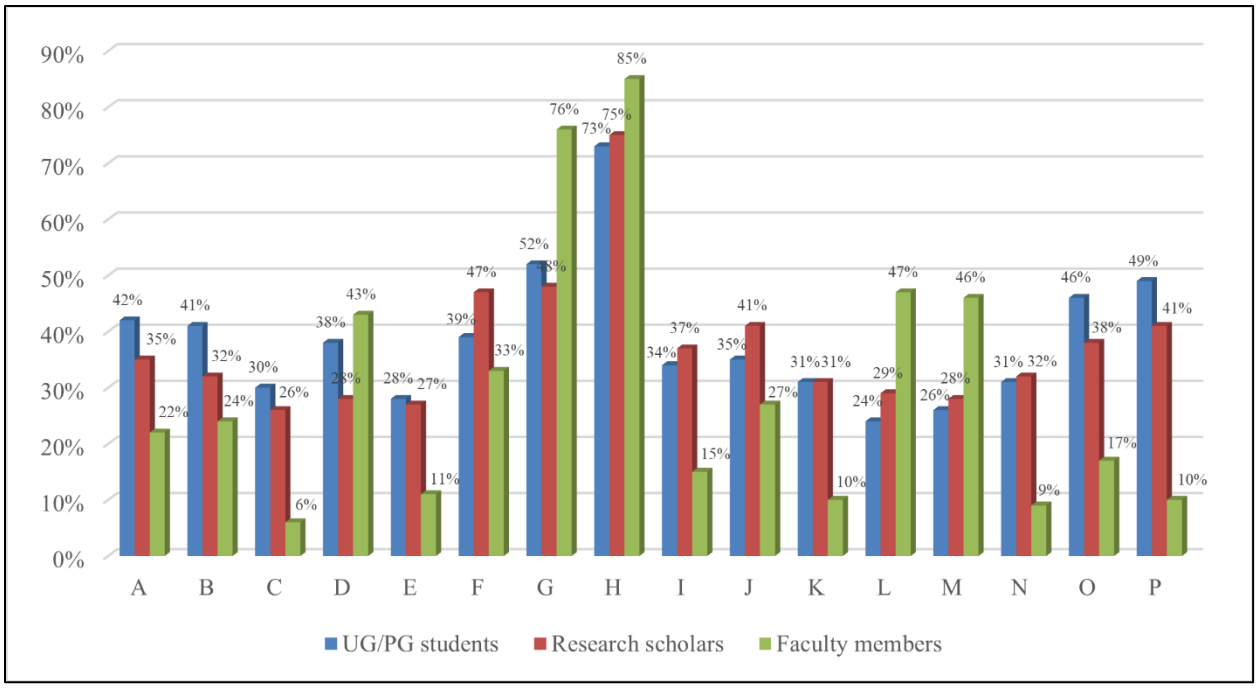
Table 4
Results of the Kruskal Wallis Test to Redesign Library Interior for a Variety of Reading Spaces

Attributes	**Groups**	**Sample Size**	**Sum of Rank**	**Test Statistics**		**Conclusion**
To optimize the physical space, the library should redesign and develop physical space with the latest tools and infrastructure to meet the expectations of users to convert into a Learner Centric Library	Research Scholars	425	227118.00	H	11.16	**p< 0.05**
	UG/PG	320	174582.00	DF	2.00	
	Faculty	378	229426.00	Tabulated Value	5.99	
	Total	**1123**		**P**	**0.003**	**Significance**

The second null hypothesis states that there are no significant differences among the views of visitor groups. Since there are three groups and the data is in the form of an ordinal scale, the non-parametric Kruskal Wallis test was used instead of ANOVA. The results of the test are given in Table 4.

Since the p-value (0.003) is less than the level of significance (0.05), the samples provide sufficient evidence against the null hypothesis, and the null hypothesis is rejected. Hence, the study reveals significant differences among visitors' opinions of optimizing the library's physical space. A pair-wise comparison study is done between the UG/PG students and research scholars, research scholars and faculty members, and UG/PG students and faculty members.

To check which group is significantly different from the others, a diagram was prepared between the opinions of the UG/PG students, research scholars, and faculty members, shown in Figure 5.



A- The suggestion has been incorporated earlier; **B**- Group study room with large table, whiteboard, and LED screen for presentation practice, seminar talk with the peer group, etc.; **C**- Makers space with facilities like 3D printers for creativity, video and audio capture, large format printing, art-related workshops, music recording spaces, and so forth; **D**- Smart classroom with movable chairs, cozy bean chair, interactive screen, whiteboard, interactive digital wall, and projector; **E**- Standing work station; **F**- Faculty study room with wi-fi facility; **G**- Quiet study room; **H**- Non-silent zone for attending mobile calls, and socializing with friends; **I**- Non-silent zone for attending mobile calls, and socializing with friends; **J**- Open space: A variety of study spaces accommodating individual, small group ,and large group study; **K**- Seminar room with 10-20 people seating capacity with whiteboard, chalkboard, and presentation display; **L**- Web conference room with Polycom conference phone and technology; **M**- Presentation room with the microphone; **N**- Living room seating with chairs and small tables with large monitors for laptop hook up; **O**- Coffee dispensing machine near every reading hall; **P**- Small table with a chair near a glass window for natural light reading

Figure 5
Views of visitors about redesigning library interior for a variety of reading spaces.

Table 5
Results of Mann-Whitney U Test to Redesign Library Interior for a Variety of Reading Spaces

Groups	Sample Size	Sum of Rank	Test Statistics		Conclusion
UG/PG students	320	162073	U	64452	**P> 0.05**
Research Scholars	425	115812	Z	-1.2202	
Total	**745**		**p**	**0.1112**	**Insignificant**
UG/PG students	320	163593.5	U	73068.5	**p< 0.05**
Faculty members	378	159212.5	Z	-2.212	
Total	**698**		**p**	**0.0135**	**Significant**
Research Scholars	425	1029405	U	51580.5	**p< 0.05**
Faculty members	378	141010.5	Z	-3.352	
Total	**803**		**p**	**0.0004**	**Significant**

From Figure 5, it is observed that the opinion of UG/PG students (73%), research scholars (75%), and faculty members (83%) is almost the same about the quiet study room whereas for other items, the opinions of UG/PG students and research scholars are similar but differ from faculty opinions. To validate the results, the Mann-Whitney U test was used. Table 5 presents the results of the test.

Based on the above table, no significant difference exists between the opinions of the UG/PG students and research scholars, whereas there is a significant difference between the opinions of UG/PG students and faculty members, as well as between research scholars and faculty members.

UG/PG students and research scholars' opinions are similar, as might be expected, because they spend a considerable part of their daytime in the library building for study, learning, and informal discussions with their peer group. They use the library space to access subscription e-resources, read important materials, use reference sources, and concentrate alone. They desire a comfortable setting with modern amenities so they may study for a longer period. They want various types of reading space, such as quiet study, group study, presentation room, discussion room, and research scholar's carrels, which are either not available or few in number.

The views of faculty members vary from that of UG/PG students and research scholars. They rarely visit the library, and only for a short time to access print journals or issue/return books, so their perception of reading space is different from that of frequent users.

Table 6
Duplicity of Availability and Less Readership of Print Resources (Overall Views)

Attributes	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total	Median	QD
	1	2	3	4	5			
These resources are available online in JSTOR, Portico, and Sodhganga (Reservoir of Ph.D. theses) at INFLIBNET	12	98	299	384	330	1123	4	2
	1%	9%	27%	34%	29%			
There is less readership of these print resources and storing the hardcopies is a wastes important library space	85	204	333	324	177	1123	4	2
	8%	18%	29%	30%	16%			

The calculated value of the median for the UG/PG students, research scholars, and faculty members is 4 for both attributes, "Duplicity of availability" and "less readership of print resources." The results show that the respondents "Agree" with the reason that these resources are available in JSTOR and Sodhganga and there is less readership of these resources.

Discussion

It is evident that the UG/PG students and research scholars frequently visit the library, whereas faculty members hardly go to the library. The reason for fewer visits by faculty members may be less dependency on information resources and being busy with other academic as well as administrative work of the university. They may also either use the faculty reading room for accessing e-resources or reading books/magazines.

More than 60% of the UG/PG students and research scholars spend more than 4 hours per visit in the library building, which indicates that, after classroom activities, students and researchers spend time in the library building for reading, research work, preparation of exams, and more. However, only 2% of faculty members spend more than four hours.

During their stay in the library building, most of the UG/PG students and research scholars use the reading hall. They sometimes visit the book stacks, bound periodicals sections, reference collection, and the theses/dissertations section. A small number of faculty members spend most of their time in the library reading room. It can be deduced that the reading hall is the most preferred space among all areas of the library building.

The study also shows that the perception of faculty members about the usage of reading space is different from the UG/PG students and research scholars. This may be because the faculty members visit the library only rarely or infrequently during a year. They may use the faculty reading room for accessing e-resources or reading books/magazines, while students and research scholars visit the library regularly and frequently. The study shows that most visitors are interested in optimizing the physical space. Hence the library should redesign and develop the physical space with the latest tools and infrastructure to meet the expectations of users.

The study also shows that all user groups do not agree that archives of research journals and Ph.D. theses are available online in JSTOR, Portico, and Sodhganga (repository of the digital copy of Ph.D. theses) at INFLIBNET respectively. Again, all users' groups do not agree that "there is less readership of these print resources and storing the hardcopies is wastage of valuable library space." Some reasons for this may be: users may worry they will not be able to get articles in the future if online subscriptions are cancelled; or users do not know whether all Ph.D. theses are uploaded to the Sodhganga platform.

The users also suggested the following in response to our open-ended questions:

- "Very quiet reading hall is a must"
- "Library should indeed be modernized but it must be maintained"
- "Space for reading hall is very less. There are many sections which are not used by many students. If these sections are converted to reading halls it will be useful"
- "Research carrels for all Ph.D. research students is a must"
- "The library foremost needs online access to all major journals"
- "I can see that you have brilliant ideas in making library more advanced and suitable for the next generation need. Despite the fact, we are moving towards the digital resources encourage soft study material"
- "Small & smart furniture for reception /issuing counter and also for book stacks"
- "Use e-resources more to eliminate hard redundant material"
- "To weed out very old, worn-out books but at the same time at least two copies of classics should be retained"
- "Large empty spaces such as entrance area etc. can be lined with books"
- "Our library space and collection seem outdated, the reason I visit less frequently. Needs urgent revamp"

It is expected nowadays that, when information resources are available at all times through laptops, desktops, and mobile phones, there may be less user demand for reading space in the library. But the study reveals there is more demand for reading space with a variety of spaces for collaborative study, group study, discussion rooms, and presentation rooms with web cameras, conference phones, and microphones. Users want carrels for quiet study and concentration. For collaborative study, project-based learning users want 3D printers and other electronic gadgets which they cannot afford to buy. Users need more power sources for charging laptops and mobile phones for battery power backup for long hours of study.

Students like to concentrate on their project work, research writings, preparation for exams, and discussions with peers in the library, but learning does not only take place alone. It also requires discussions and sharing of ideas with peers and senior students. This study reveals that the UG/PG students and research scholars often spend more than four hours in the reading halls for informal learning from reading materials, discussions, academic discussions, and calm study. The libraries should renovate their reading areas with facilities like centralized air conditioning, power sources for recharging laptop batteries and cell phone batteries, and ergonomically built couches for extended study and concentration sessions.

Library staff of the universities should regularly assess the print collection and weed out the damaged books regularly. Library staff should replace damaged copies with new ones, as the damage may be indicative of high demand and overuse. These books are used by many visitors who have marked, commented, and highlighted important notes, and text in the books. In such a case, a new copy of the

book should be ordered. If a title is not available in the market, it can be digitized for online access if permitted by law.

Limitations

The study has collected data on the usage of space, reading materials, and time spent in the library by users through the questionnaire. To verify the validity of the responses, an observational study could have been performed, but was not possible due to time constraints and other factors.

Conclusions

Libraries built in the 20th century had the architectural design to accommodate ever-growing print collections. There was no concept of e-books, e-journals, or online databases. Seating arrangements were planned in reading halls, and the main emphasis was on bookshelves to stock more print material. In the last two decades, the format of reference sources and journals has changed from print to online, accessible around the clock. The number of library users has also increased, but library space remains unchanged, and funding is not available to expand spaces.

Although users can access online resources anywhere, they still want to study, concentrate, socialize, and learn in the informal learning environment. Users require quiet space, group study rooms, presentation rooms, wi-fi, power sources, windows for natural light, and research carrels.

New educational institutions should keep in mind the creation of varied reading spaces for serious reading, pleasure reading, long hour reading, and interactive learning spaces in new library buildings. While developing new or renovating existing reading space, librarians and administrations should consult library users for their preferences. Over time, the availability and format of knowledge resources have changed. To keep library buildings relevant, institutions need to update the internal spaces as well. The library building is a key non-residential and non-formal learning space on a university campus. The library building should have the latest information technology and other infrastructure related to reading halls to create an ecosystem for learning and study. Hence, there is a need to re-purpose the existing library reading space not only to access online resources but also for creativity and learning.

Further research may be conducted such as a focus group study or ethnographic study to understand what users do in the library during their stay, what they do in the reading hall, for what purpose they use the reading halls, how they use the reading halls, and occupancy level of reading halls during a different time of the day and different time of the year. These studies will give an idea of human resource and infrastructure management for the library to better serve users.

Although the study was conducted in two large libraries in India, the output of the research may be applied to many academic libraries in developing countries that are built in the last century. There is a need to refurbish reading halls to meet users' expectations, as now the libraries are treated as “the informal learning space where the users not only learn from the reading materials available on the shelves but also learn from their peers in the reading halls” (Choy & Goh, 2016).

Academic libraries all over the world should update their reading areas to attract more users and increase traffic to the structure. To satisfy library users, academic libraries should reconsider turning their collection-centric buildings into learner-centric spaces and should offer a range of reading areas.

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Appendix
Questionnaire

Personal Details

Name of the respondent:
Course:
School/Center/Dept
Name of the University
Age: Sex:

1. Do you visit your University Library
   A. Yes B. No

If your answer is No the skip the Questions 2-7.

If your response is "Yes" then…

2. How frequently do you visit your University Library?
   A. Daily B. 2-3 times a week C. Weekly once
   D. Once in month E. Once in 2-3 months F. Once in six months
   G. Once in a year

3. How long you stay in the library building in a visit?
   A. Less than one hour B. Between one to two hours
   C. Between two to three hours D. Between three to four hour
   E. More than four hours

4. For what purpose do you visit the library?

S.N.	**Purpose**	Most of the time	Sometimes	Rarely	Never
1	Issue/Return of Books				
2	Reading of Books and Journals of your subject interest in the Reading Hall				
3	To access e-resources subscribed by library using Desktop available in the library				
4	To access e-resources subscribed by library, email, using personal Laptop in the Reading Hall				
5	Browsing and reading of print Magazines, Journals and Newspapers				
6	To consult Reference materials that are not issued to use out of library building like (Ph.D. Theses, MPhil Dissertations, and Bound Volumes of Journals)				
7	To study in the Research Scholar's Carrel				

Mention if any: [Comments]

5. While in the library, which resources do you use? (Rank them)

S.N.	Resources	Most of the time	Sometimes	Never
1	Printed resources like books and latest issue of print research journals of your area of research			
2	Access online resources subscribed by library.			
3	Refer hard copy of Ph.D. Theses and Dissertations, Reference materials and Bound volume of Journals			

6. During the stay in the library, what share of time do you spend in various sections of the library?

S.N.	**Areas**	Most of the time	Sometimes	Rarely	Never
1	General Reading Hall				
2	Research Scholar's carrel				
3	Periodical section				
4	Stacks area of books				
5	Reference section				
6	Bound volume section				
7	Rare collection				

7. Please show your preference of format of information sources.

S.N.	**Information Resources**	Print			Online		
1.		**Preferred**	**Desirable**	**Neutral**	**Preferred**	**Desirable**	**Neutral**
	General Books						
2.	Textbooks						
3.	Research Journals						
4.	Reference Sources (Yearbook, Dictionary, Almanacs, Handbook, Encyclopedia, Statistical Data Book, etc.)						
5.	Back volume journals & Ph.D. Theses						

8. Show your agreement/disagreement to the following.

To optimize the physical space in the library, the shelf space management is required.

Proposed view	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Damaged/mutilated books should be weeded out to accommodate new titles					
Textbooks belong to out of syllabus, outdated, or courses closed in the University should be weeded out					
Equal number of old and never used/issued books since 2 decades *[books not used in 20 years]* should be replaced with new titles.					

9. From which location do you prefer to access e-Resources (Rank them 1 for first preference and 2 for second preference)

S.N.	**Locations**	**Preference**
1	In the Library	
2	Outside the library from hostel/resident /campus using remote access facility	

10. Why do you visit Library building to access the subscribed online resources although remote access facility is available to access the same from outside?

Reasons	Strongly Agree	Agree	Neutral
Air-conditioned reading hall with wi-fi, laptop charging point for longer hour battery backup and cosy/comfortable chair/table arrangement.			
Reading with friends and other library users motivate you to read longer hour			

Mention if any [Comments]

11. Show your agreement or disagreement to the following view:

"In order to optimize the Physical Space of the library, the bound volume of journals, print copy of Ph.D. Theses and Dissertations, never issued/least used/old edition of textbooks, Reference sources; should be shifted from main building as these materials occupy major chunk of library space,"

Reasons	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
All these resources are available online and you prefer to access online.					
You require them frequently for your research and these resources are not available in online in your subject of interest.					
These are the beauty of the library collection, so they should not be shifted from the main building.					
Duplicity of availability of knowledge resources online is wastage of physical space.					

12. Show your agreement or disagreement to the following suggestion

"Looking into your expectation and trends of availability of online resources, should your Library; redesign its physical space to convert it into Learner Centric from Collection Centric."?

A. Agree B. Disagree

If your response is "Disagree" skip Question No 13

If your response is "Agree," then

13. To optimize the physical space; your Library should redesign and develop physical space with latest infrastructure to meet the users' expectations.

S.N.	Infrastructure	Must	Desirable	Not Required	Can't say
01.	Large Table Study Room with whiteboard.				
02.	Group study room with large table, whiteboard and LED Screen for presentation practice, seminar talk with peer group etc.				
03.	Makers space with facilities like 3D Printers for creativity, video and audio capture, large format printing, art-related workshops,				

	music recording spaces, and so forth.				
04.	Smart classroom with moveable chairs, cozy bean chair, interactive screen, white board, Interactive Digital Wall and projector.				
05.	Standing workstation.				
06.	Carrels for Research Scholars study.				
07.	Faculty Study Room with wi-fi facility				
08.	Quiet Study Room.				
09.	Non silent zone for attending mobile phone call and socializing with friends.				
10.	Open Space: A variety of study spaces accommodating individual, small group, and large group study.				
11.	Seminar Room with 10-20 people seating capacity with whiteboard, chalkboard, and presentation display.				
12.	Web Conference Room with polycom conference phone and technology.				
13.	Presentation Room with microphone, microphone stand and polycom conference phone.				
14.	Living room setting with chairs and small tables with large Monitors for Laptop hookup.				
15.	Coffee dispensing machine near every reading hall.				

16.	Small table with chair near glass window for natural light reading.				

Mention if any: [Comments]

Date:

Signature of Respondent

Place: