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Original Research

An Investigation of the Architectural Spaces of Shiraz University Libraries with respect to Design Standards as well as Academic Library Standards

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Abstract

This study investigates the architectural spaces of Shiraz University Libraries from users' viewpoints on architectural concepts and academic library standards. It also explores the architectural areas, appropriateness, and arrangement of internal communication inside the libraries and the strengths and weaknesses regarding activities performed in a typical academic library. The research method was a descriptive survey with a quantitative and qualitative approach. There were two statistical populations in this study. One was all the libraries in the faculties of Shiraz University, whose buildings have been designed for this purpose from the beginning. The other was all the students of different fields in the faculties of engineering, humanities, educational sciences, social sciences, law, veterinary medicine, agriculture, and basic sciences of Shiraz University. The optimization method was Cochran's formula to determine the sample size. A researcher-made questionnaire for users containing fifty-four items on eight aspects of libraries, namely: the exterior space, main entrance space, circulation desk space, nonprint materials space (audio-visual resources, electronic resources, and databases), reference sources space, study hall space, hallways and service spaces and environmental issues such as air-conditioning. Another tool was a checklist based on the standards for Iranian university libraries and the fourth edition of the Sannwald Checklist (2009) published by the American Library Association. Based on this checklist, the spaces of the libraries were examined by observing and interviewing the library staff. The results obtained from the users' point of view, observation of libraries, and interviews with staff show that although some standards have been considered in the overall design of the library buildings of Shiraz University, many architectural standards and concepts have either been ignored or not fully considered in subspaces. The main problem seen in almost all libraries is the lack of a special entrance for disabled library patrons. In most cases, users' attitudes were in line with staff opinions and observations.

Keywords: Academic Library Architecture, University Library Spaces, Academic Library Standards, Academic Library Building, Shiraz University Libraries, Iran.

Introduction

Academic libraries are established to accelerate educational and research processes to protect, expand, and promote knowledge. Such libraries support the educational and research objectives of the universities to meet the needs of students and academic staff. To gain such goals, a series of activities are planned for libraries. One of the most fundamental factors in the efficient performance of these activities is the architecture and allocation of different spaces, which plays an essential role in the success or failure of university programs. There is an apparent relationship between the spaces designed in the library and the ratio of delivering services since a university library mirrors its scientific and educational capabilities. This makes the interior and exterior design of each library a critical matter. The architectural design of spaces in accordance with the activities of an academic library enables librarians to perform their duties appropriately, deliver necessary services to the users and meet their needs adequately. Evaluating library spaces for their effectiveness and efficiency in meeting patron needs is essential for planning library facilities (Potthoff, Weis, Montanelli & Murbach, 2000).

An architect can predict necessary spaces for a library when studying the community of users and the goals of a library providing services for them. This prioritizes the importance of understanding the services a library should deliver and efficiently specifies spaces in line with the activities. Moreover, the university library architecture should consider the relationship between spaces, arrangement, interior relations, light, and natural landscapes. The architecture of the library inexorably affects the performance of activities. For example, the study hall, one of the most used spaces within the library, could be made more pleasant for the users by designing appropriate scenery and the potential available for an effective design within the site. The use of focal lighting is as essential as natural lighting and landscapes inside the library as this enables the users to adjust the light according to their needs. In the university library building design, the facilities for circadian use of study hall, internet, and public places such as drinking fountains, toilets, and so on are needed to enable students and researchers to use the library at any required time.

With a history of more than half a century, Shiraz University is one of Iran's largest and most important universities. But, with a thorough look at the buildings of the university library and spaces devoted to different activities, it becomes clear that such facilities are not meeting the educational and research needs of the university entirely. For example, various services that are supposed to be delivered in different sections of the libraries per international and national standards of universities fail to be delivered successfully because of lack or insufficiency of designed spaces. The size of needed spaces within a university library depends on the number of students, the size of the complex, and the number of employees within the library. Considering the factors mentioned above and standards for Iranian University Libraries (Taavoni, Soltani, Hariri & Mehrad, 2002), the question is whether spatial standards and university library standards have been fulfilled or not.

This study examines the spaces in the libraries of Shiraz University in terms of architectural concepts required to carry out daily routines and activities. Hence, in the first place, we tried to discover the views of the users of these libraries and adapt them to the existing architectural spaces. At the same time, the strengths and weaknesses of these spaces

were other important factors that we carefully monitored. With this in mind, the researchers expect the results of this study to help the chief librarians and architects in the remodeling of the present spaces or designing a new university library building.

Research Questions

1. What is the attitude of Shiraz University libraries' users towards architectural subspaces, (namely exterior library spaces; the main entrance of the library; circulation desk; non-printed materials; reference sources, periodicals, thesis dissertations; study hall space; hallways and service spaces) and environmental considerations?
2. Have the standards of academic libraries been taken into consideration in the design of Shiraz University Library spaces?

Literature Review

Spaces in an academic library should be prepared and designed based on their activities. In recent decades, there have been fundamental developments in designing academic library buildings and meeting users' needs (Choy & Goh, 2016). In response to frequent inquiries and demand for information about planning and designing academic library buildings and spaces, the Association of College and Research Libraries (ACRL) and LLAMA (Library Leadership and Management Association) have joined efforts to provide a basic framework for architects, planners, and librarians embarking on the planning and design of libraries for higher education. This Guide will provide the necessary information and knowledge for creating new and renovated library spaces moreover, it will point to additional resources that can support, inform and enhance the academic library design process (Association of College and Research Libraries, 2020). Based on The standards for academic libraries in Iran (Taavoni et al., 2002), "academic libraries should prepare a suitable place for keeping and storing their resources and foresee sufficient spaces for employees, users and present their services and programs." This standard includes qualitative and quantitative guidelines for library buildings and their equipment and supplies.

Factors that determine the amount and type of university library space include the number of students, faculty members, and educational and research programs. In addition, the type of services and the extent of their expansion, in the long run, the number, and type of resources, the number of employees and their possible increase, tools, and equipment related to the various services and modern technologies are effective in designing university library spaces.

Concerning the mentioned factors for academic library standards, guidelines can be summarized into the following factors:

Needs: Various activities take place in a library, which can be categorized into three main areas: personnel, users, and commonalities between the two. In the personnel department, activities such as collecting, organizing the sources, and preparing materials are done. In the common areas, services such as references, circulation desk, and general library services benefit both employees and users. Finally, the users' section that merely users help consists of study spaces, circulation desks, etc.

Communication: Spaces in different sections of a library should be designed to ease the communication between the personnel and users and vice-versa.

Access: The places of the various library sources should be such that the personnel and users have easy access to them. Also, in designing library buildings, the unique needs of the

disabled should be considered so that ramps and elevators can be used wherever necessary.

Dimensions of spaces: Factors such as number of librarians, personnel and the spaces they need, number of books and their sizes, number of simultaneous users (males and females), educational and research program of the university, number of majors, degree levels for the present and long-term, and the spaces needed for a library, etc. are influential in determining the dimensions of a library.

Environmental conditions: Sufficient light, sunlight direction, lamplight locations, heating resources, and installation are essential in designing libraries.

Flexibility and expansion: Library buildings should be flexible so that in case of necessity, they can be expanded for future activities. Designers must note that flexibility is crucial in using library spaces, arranging internal communication, merging and converting spaces, and changing their utilization. Furthermore, the possibility of using the equipment and instruments should be predicted as technology advances.

Protection and security: Library sources are the essential pillars of a library building. Thus, the entrances and exits should be limited, and surveillance methods should be installed.

The shape of library spaces: All qualitative and quantitative factors influence the shape of the library spaces.

Some studies have been carried out on the architecture and design of academic libraries in Iran and other countries. By reviewing the literature, one can conclude that the investigations, in general, have dealt with the academic library to be reconceptualized as a place to foster creativity and innovation in students. The academic libraries should provide a variety of spaces for students, sometimes they are in contradiction, such as quiet spaces for reflection and concentration, and noisy spaces (browsing areas or rooms) for joint working, networking, and spaces for experimentation (Bieraugel & Neill, 2017); Another study investigates the reasons that the new library space projects were undertaken and the forces driving decisions about investments in the library facilities (Gstalder, 2017).

In addition to architecture and design, there are other areas that researchers paid particular attention to them. They are crucial and vital in providing a convenient place for working and studying, such as the physical conditions of the buildings, spaces, air-conditioning, equipment, and safety principles (Sharifi Moghadam, 2007); the role and position of nature in the architecture of academic libraries (Naseri, 2010); the effect of colors in interior architecture (Cheshmehe Sohrabi, Rahim Salmani & Rahim Salmani, 2011); Instruments, equipment, colors, textures, arrangement and all the visible factors in a library, are inseparable parts of the interior design of libraries. Despite their importance, these factors should be in harmony and complementary so that the final result of interior design for libraries is satisfying and attractive from the aesthetic viewpoint (Taavoni & Asefi, 1998).

Mansoorian (2008), in his article entitled "one hundred characteristics for a good academic university," has mentioned a hundred characteristics of academic libraries. Ten of them relate to building and equipment, including stability and enough area, sufficient spaces for placing printed material and computer equipment, enough space for study so that users benefit from the sources and air conditioning which prevents decay of printed material and eases the disabled user's attendance. Updated computer access to indexes and the electronic network sources, use of natural light in the library, library equipment, safety rules, and necessary instruments to save users and resources in case of danger are mentioned, too.

What distinguishes this research from previous ones is that this study investigates the

university libraries in terms of different methodology, which in turn is a prominent indicator.

Materials and Methods

The present study is applied in its purpose, descriptive nature, and method. With a quantitative and qualitative approach, information was collected through questionnaires, interviews, and regular observation.

In this study, there were two statistical communities; one included all the libraries in the faculties of Shiraz University, from which libraries were selected as a sample whose buildings were built from the beginning for becoming a library, in the faculties of Shiraz University (located in Shiraz, southern Iran). The other statistical population was all students of Shiraz University who use their special libraries as follows by college and library name: Engineering College (Kharazmi Library); Humanities, Social Sciences, Education and Psychology Colleges (Central Library and Documentation Center); Law and Political Sciences (Law Library); Veterinary Medicine (Shahid Hasheminezhad Library); Agriculture College (Shahid Mofateh); and College of Sciences (Mollasadra Library). According to the statistics obtained from the university management, the number of students at the time of the study was approximately 11,608. Cochran's formula was used to determine the sample size. Since the students were studying in different faculties, it was necessary to decide on the sample size by the optimization method; thus, the sample size was determined by the optimization method from Cochran's formula to be 1528 people.

The research tool was a researcher-made questionnaire for users and a checklist[1], both based on the Standards for Iranian University Libraries and based on the fourth edition of the checklist (Sannwald, 2009) published by the American Library Association and Standards for Libraries in Higher Education (Association of College and Research Libraries, 2011). Users' opinions about public spaces were explored through a researcher-made questionnaire containing 54 questions about eight dimensions (exterior library space, main library entrance, circulation desk space, nonprint materials space, reference resource space, study hall space, hallways and service spaces, and environmental issues such as ventilation, cooling/heating, and light). The validity of the questionnaire was performed using face validity. Cronbach's alpha coefficients were used to determine the reliability of the questions, and we found that the items were reliable. After distributing the questionnaires among the students, 1157 questionnaires were completed and returned.

To interview and view the spaces, the mentioned libraries were referred to. Using the staff checklist of different sections of the libraries, regular interviews were conducted, and the spaces of different sections of the libraries were observed. These spaces included the location of libraries, office space and management, spaces in the field of technical services including (resource organization and collection section), public spaces, resource section, circulation including (connection of internal spaces for staff and clients), storage area, service spaces and support of information and communication technology, environmental conditions, control, and security).

Results

Findings are presented in two parts. First, the data obtained from the user questionnaire (including public spaces) were analyzed using descriptive and inferential statistical methods. Then the information obtained from interviews with staff and observation of library spaces is

described qualitatively.

Findings from the user questionnaire (users' points of view towards libraries' architectural spaces)

Demographic Details

The study collected 1157 responses, and the sample included more females (n=59.9%) than males (n= 38.6%). Majority of respondents were undergraduates (n= 52.1%) followed by graduates (n= 32.7%) and Ph.D. students (n= 12.7%0) respectively. Result about students' frequency of library use shows that only 12.3% of them use the library every day, 16.6% once a week, 33.6% occasionally, and 35.3% several times a week, respectively. 2.2% of respondents did not answer this question.

Exterior Library Spaces

Exterior library spaces were assessed by nine items, namely: the location of the library regarding easy access, a green environment suitable for its use, the congruence of form and view, congruence of form and size with the outdoor green plants, sufficient parking lots for users, easy access between parking and the building, the visual and aesthetic location of the parking and enough light provision for outdoor spaces. The most negative attitude is toward parking (M= 1.18), whereas the most positive attitude is toward easy access to the library (M= 2.44). Friedman's test shows a significant difference between mean ranks ranging from 3.62 to 6.73 ($\chi^2 = 512.1$, $p< 0.05$).

Some of the exterior library space items did not exist in some libraries. Therefore, the mean score of respondents was calculated based on existing items. Results showed that their scores in all libraries varied from 0 to 3, and the mean score was 1.81, which is less than the average (2). According to the Kolmogorov-Smirnov test, the difference between scores was significant, and data distribution was non-normal (Z score =1.99, SD = 0.59, P<0.007). Kruskal-Wallis test showed that there was a statistically significant difference between the mean ranks of respondents' attitudes toward exterior library spaces in libraries ($\chi^2 = 39$, P=0.000) with the least mean rank of 340.64 for Mollasadra and the highest mean level of 502.99 for the Law library (Table 1).

Table 1
Kruskal Wallis test for comparison of mean score of respondents' attitude toward Exterior library spaces

Library	Mean	Mean rank
Kharazmi	1.76	398.13
Central Library and Document Center	1.93	480.11
Shahid Mofatteh	1.74	389.62
Mollasadra	1.59	340.64
Law	2.02	502.99
Shahid Hasheminezhad	1.83	427.04
Sig = 0.000		$\chi^2 = 39$

Main Entrances Spaces

Six items namely assessed the main entrance spaces of Shiraz University Libraries: view

of the entrance to the building, individual and group attendance and exits, lobbies, the width of steps and entrance ramps, proper light in entrances, accessibility for the disabled to enter the building and adequate rooms and lockers for placing the users' belongings. Results indicated the most negative attitude is toward the access of the disabled to enter the building (M= 1.36). Another unfavorable item was the lack of proper lockers (M= 1.72). The most positive attitude was toward the lighting of the entrances (M= 2.21). According to the Friedman test, the mean ranks of respondents' scores were between 2.59 and 3.96 ($x^2 = 254.4$, $P< 0.01$). The mean score of respondents' for one item from all items of main entrance spaces was 1.98, which was less than the average (2). According to the Kolmogorov-Smirnov test, the score difference was significant, and data distribution was non-normal (Z score =2.22, SD = 0.58, P=0.000).

Based on the Kruskal-Wallis test, there was a statistically significant difference between the mean ranks of respondents' attitudes toward main entrance spaces ($\chi^2 = 31.4$, P=0.000) with the least mean rank of 348.9 for Shahid Mofatteh and the highest mean level of 475.44 for Kharazmi library (Table 2).

Table 2
Kruskal Wallis test for comparison of mean score of respondents' attitude toward main entrance spaces

Library	Mean	Mean rank
Kharazmi	2.1	475.44
Central Library and Document Center	1.97	424.34
Shahid Mofatteh	1.8	348.9
Mollasadra	1.85	380
Law	2.07	466.98
Shahid Hasheminezhad	2.09	473.15
Sig=0.000		$\chi^2 = 31.4$

Circulation Desk Location

The space of the circulation desk has been measured according to four items, namely, visibility from the main entrance, easy and direct access from the main entrance to the circulation desk and reservation, appropriate and proper space for users at the circulation desk, the location of the circulation desk for the study hall so that the speaking of personnel and instruments do not bother the users. Respondents' attitude to these items is at the medium level, and the mean scores were from 1.89 to 2.1. The most positive attitude is "appropriate and proper space for users at the circulation desk." The most negative attitude is toward the location of the circulation desk since personnel, telephones, and fax bothers users in the study hall. Friedman test results show the mean rank of this aspect for all the libraries is between 2.31 and 2.6. The Chi-square test is 22.2, significant at the 99% level, and generalized to the whole population.

The space of the circulation desk in all of Shiraz University Libraries is medium from the user's viewpoint. For all of the libraries (M= 1.97), which is lower than the average level (2). The obtained Z-score from the Kolmogorov-Smirnov test was 3.73, which is significant (Table 3).

Table 3
Table 3

The least, most, the mean and standard deviation of Respondents' score for space of the circulation desk of Shiraz University Libraries

item	Minimum	Maximum	mean	SD	Z score	Sig.
rate	0	3	1.97	0.58	3.73	0.000

Comparing the means for different Shiraz University Libraries show the lowest means are for Kharazmi and Mollasadra Library. Therefore, the space of circulation desks at these two libraries is improper. The most relevant issue belongs to Shahid Hasheminezhad and Law libraries. The mean rank was 248.44 (Kharazmi) and 511.72 (Shahid Hasheminezhad). Regarding the Chi-square obtained from the Kruskal-Wallis test, 119.36, the differences are significant and can be generalized to the whole statistic population (Table 4).

Table 4
Test of significant difference in the means of "attitude toward space of the circulation desk of libraries" among respondents

Library	Mean	Mean rank
Kharazmi	1.46	248.44
Central Library and Document Center	2.18	442.34
Shahid Mofatteh	2.13	433.71
Mollasadra	1.68	302.49
Law	2.31	496.8
Shahid Hasheminezhad	2.38	511.72
Sig=0.000		$\chi^2 = 119.36$

Spaces Allocated to Nonprint Materials

The spaces allocated to nonprint materials were assessed according to four items, namely, proper space for electronic search in the sources, suitable and enough space to use the electronic sources, available and adequate space to use the audio-visual sources, easy and direct access from the main entrance to the search location of nonprint materials. These spaces are not suitable. Audio-visual space (M= 1.41) is relatively low. The space for electronic search (M= 1.82) was the best issue in this part. As it is observed, this mean was lower than the average of 2. The mean rank for nonprint material space was between 2.18 and 2.66. The Chi-square was obtained from the Friedman test ($\chi^2 = 50.57$) which is significant at the 99% level. The results show the allocated spaces for nonprint materials are not desirable at Shiraz University libraries since the mean score for one item of all items of the libraries in this aspect was 1.69, which is considered inappropriate. The Z-score from Kolmogorov-Smirnov was 3.47, which is significant (Table 5).

Table 5
The least, most, the mean and standard deviation of Respondents' score for the space of nonprint materials at Shiraz University Libraries

item	Minimum	Maximum	Mean	SD	Z score	Sig.
Rate	0	3	1.69	0.82	3.47	0.000

The Kruskal-Wallis test was used to test the significance of differences in the mean for

respondents' scores for spaces allocated to nonprint materials. The mean value for this space was 1.26 for Mollasadra Library and 2.13 for Shahid Hasheminezhad, which enjoys a better condition. Furthermore, the mean rank for nonprint material spaces was between 280.35 for Mollasadra Library and 520.86 for Shahid Hasheminezhad Library. Considering the Chi-square ($\chi^2 = 320.05$) at the 99% level, the differences are significant (Table 6).

Table 6
Test of significant difference in the means of "attitude toward space of nonprint material of libraries" among respondents

Library	Mean	Mean rank
Kharazmi	1.75	416.75
Central Library and Document Center	1.87	449.71
Shahid Mofatteh	1.4	320.05
Mollasadra	1.26	280.35
Law	1.73	420.53
Shahid Hasheminezhad	2.13	520.86
Sig=0.000		$\chi^2 = 320.05$

Architecture Condition For the Space Allocated to Reference Sources, Periodicals, and Dissertations.

The spaces for reference sources, periodicals, and dissertations were assessed according to 9 items, namely, accessibility to reference collection, proper space for study at reference sources, necessary and sufficient equipment to use reference sources, suitable lighting at reference halls, adequate space to search for reference sources and space required to place desks and chairs for study at periodical section, proper space to use the dissertations, direct and easy access from the main entrance to search location of reference materials and the location of personnel desk so that it does not bother the users. The results show in general, the means of 8 items out of 9 were more than the average, 2. However, for the item "personnel not to bother the users with respect to the location of reference desk", the respondents' mean was 1.92, which is lower than 2. The mean rank for these items for the whole university was between 4.53 and 5.44. The differences regarding the Chi-square obtained from the Friedman test at the 99% level are significant and can be generalized to the statistical population.

For one item of all items for the spaces of reference sources, periodicals, and dissertations, (M= 2.07) which is slightly higher than the average mean, 2. The Z-score obtained from Kolmogorov-Smirnov was 2.29, which is significant and denotes the non-normal distribution of data (Table 7).

Table 7
The least, most, the mean and standard deviation of Respondents' scores for the spaces of reference sources, periodicals, and dissertations

item	least	most	mean	SD	Z score	Sig.
Rate	0	3	2.07	0.6	2.29	0.000

A comparison of the spaces related to reference sources, periodicals, and dissertations in different libraries indicates that the central library and document center have proper conditions (M= 2.21). The results obtained from the Kruskal-Wallis test show the mean rank of different

libraries regarding reference sources, periodicals, and dissertations was between 319.11 for Mollasadra Library and 457.13 for Central and Document Center. Considering the obtained Chi-square ($\chi^2 = 39.95$) at the 99% level is significant and could be generalized to the whole population (Table 8).

Table 8

Test of significant difference in the means of "attitude toward spaces of reference sources, periodicals and dissertations of libraries" among respondents

Library	Mean	Mean rank
Kharazmi	1.97	363.19
Central Library and Document Center	2.21	457.13
Shahid Mofatteh	1.98	367.84
Mollasadra	1.84	319.11
Law	2.15	435.93
Shahid Hasheminezhad	2.17	452.99
Sig = 0.000		$\chi^2 = 39.95$

Architectural Spaces of Study Halls

The architectural spaces of the study halls were assessed by eleven items, namely, sufficient and proper space for study proportionate to the number of users, having a calm study hall, easy access from the study hall to the circulation desk, possibility of adjusting light for every study desk independently, air-conditioning, sufficient and fresh air in study hall, aesthetic elements in study hall, eagerness and feeling of wanting to stay in study hall, feeling of privacy in the study hall, proper seasonal temperature and comfortable furniture. The results show that the study halls at Shiraz University Libraries are generally improper regarding the standards. For the "possibility of adjusting light for every study desk independently" in all the libraries (M= 1.07). Also, for "feeling of having a private surrounding in study hall (M= 1.7), which is at the unacceptable level. The means for four items are below 1.5. The mean rank of items is between 4.58 and 8.29, considering the Chi-square at a 99% level; it is significant and can be generalized to the statistical population.

The mean of the respondents' score of one item of all items for the study hall for all the libraries was 1.7, lower than the average of 2. From the students' viewpoint, the space of study halls is relatively inappropriate. The Z-score obtained from Kolmogorov-Smirnov was 0.94, which is not significant and is indicative of the normal distribution of data (Table 9).

Table 9

The least, most, the mean and standard deviation of Respondents' scores for the space of the study hall

item	Minimum	Maximum	mean	SD	Z score	Sig.
Rate	0	3	1.7	0.65	0.94	0.34

Considering the normal distribution of data for the significance test of differences of means of the items related to study hall spaces, one-way ANOVA and Tukey test were used. Results show that Kharazmi Library with 1.47 and Mollasadra Library with 1.53 have the worst position for the study hall. However, the Central Library and Document Center (M= 1.86) and Shahid

Hasheminezhad Library (M= 1.83) have the best study hall space.

Tukey test results show that the respondents' mean score for Kharazmi Library has a significant difference and is lower than Central Library, Document Center, Shahid Mofatteh, and Shahid Hasheminezhad Libraries. However, the respondents' mean score for these libraries is not significant compared to Mollasadra and the Law libraries. Also, the mean respondent's score for Mollasadra Library is lower than Central Library and Document Center and Shahid Hasheminezhad Library, and it has significant differences with them. The means for other libraries do not have significant differences (Table 10).

Table 10

Test of significant difference in the means of "attitude toward spaces of study halls of libraries" among respondents

Library	Numerical Mean	Kharazmi	Central Library and Document Center	Shahid Mofatteh	Mollasadra	Law college	Shahid Hasheminezhad
Kharazmi	1.47	-	*	*			*
Central Library and Document Center	1.86	*	-		*		
Shahid Mofatteh	1.74	*					
Mollasadra	1.53		*		-		
Law	1.71						
Shahid Hasheminezhad	1.83	*			*		
Sig -0.00			d.f=5 ,810		F=9.84		

Hallways and Service Spaces

Hallways and service spaces of University libraries were assessed by eight items, namely, separate bathrooms, water fountains, the existence of cafes near the library, size and dimension of elevators, enough elevators for the disabled, visibility of connection elements between the floors, feeling of satisfaction in using the stairs, the existence of a proper place for exhibition areas. The results show the hallways and service spaces are not appropriate. Elevators are entirely inappropriate for handicapped use (M= 0.98). Also, the respondents' mean score for the size and dimensions of elevators was 1.02. The lack of a proper place for exhibition areas was another problem for these libraries (M= 1.1). The best issue was for the toilet rooms (M= 1.7), less than average, 2. The mean rank of items was between 3.44 and 5.7. The differences according to Chi-square ($\chi^2 = 212.8$) at the 99% level are significant.

The mean of the respondent's score of one item of all items related to hallways and service spaces was between 0 and 3. The finding shows a negative view of the architecture of hallways and service spaces (M= 1.43). The Z-score from the Kolmogorov-Smirnov test was 1.73, which is significant and denotes the non-normal distribution of data (Table 11).

Table 11

The least, most, the mean and standard deviation of Respondents' scores for hallways and service

spaces architecture

item	Minimum	Maximum	mean	SD	Z score	Sig.
Rate	0	3	1.43	0.65	1.73	0.005

Kruskal-Wallis test was used to test the significance of differences in respondents' mean. The results show the mean was between 1.36 (Mollasadra) and 1.49 (Law Library), which indicates the improper position of all libraries concerning the hallways and service spaces. The least mean rank was 390.07 for Mollasadra, and the highest was 442.52, which belongs to the Law Library. The differences regarding the Chi-square ($\chi^2 = 3.34$) are not significant and cannot be generalized to the total population (Table 12).

Table 12

Test of significant difference in the means of "attitude toward the architecture of hallways and service spaces of different libraries" among respondents

Library	Mean	Mean rank
Kharazmi	1.37	403.31
Central Library and Document Center	1.45	424.39
Shahid Mofatteh	1.46	422.97
Mollasadra	1.36	390.07
Law	1.49	442.52
Shahid Hasheminezhad	1.48	432.9
Sig=0. 65		$\chi^2 = 3.34$

Respondents' attitude toward the environmental considerations at Shiraz University Libraries

Environmental issues at libraries, including heating, cooling, and air-conditioning, are the last aspect of library architecture studies in this research. Environmental considerations were assessed through two items: "a pleasant temperature for all spaces in different seasons" and "having pleasant air in different spaces of libraries." The results show that the mean of the respondents' scores on environmental issues, in general, was 1.88 and 1.89 for these two items, which are less than the average. Friedman test results show that the mean rank for these two items was 1.49 and 1.52, respectively. Considering the Chi-square, it appeared there was no significant difference between the two items. One item related to environmental issues (M= 1.88) is less than the average, 2. The Z-score obtained for the Kolmogorov-Smirnov test is 6.46, which is significant and indicative of the non-normal distribution of data (Table 13).

Table 13

The least, most, the mean and standard deviation of respondents' scores for environmental issues

item	least	most	mean	SD	Z score	Sig.
Rate	0	3	1.88	0.77	6.46	0.000

The comparison of respondents' means in different libraries shows that the lowest is for the Kharazmi library (M= 1.61). However, Hasheminezhad library (M= 2.10) has the best environmental issues. The mean rank for respondents' scores was between 351.76 and 479.39. Regarding the Chi-square ($\chi^2 = 25.35$) obtained from the Kruskal-Wallis test, at a 95% level, it is significant and can be generalized to a completely statistical population (Table 14).

Table 14

Test of significant difference in the means of "attitude toward environmental issues of different

libraries" among respondents

Library	Mean	Mean rank	Chi=square	Sig.
Kharazmi	1.71	351.76	25.38	0.0001
Central Library and Document Center	1.93	421.9		
Shahid Mofatteh	1.9	411.39		
Mollasadra	1.75	354.05		
Law	2.07	458.56		
Shahid Hasheminezhad	2.1	479.39		

Architectural spaces were assessed in eight aspects by fifty-four items. The results show that the mean of one item of all items related to spaces of Shiraz University Libraries was between 0.1 and 2.98. For one item (M= 1.86), which is less than 2. Thus, the architectural spaces of Shiraz University Libraries are less than the average. The Z-score obtained from the Kolmogorov-Smirnov test was 0.84, which is not significant and denotes the non-normal distribution of data (Table 15).

Table 15

The least, most, the mean and standard deviation of respondents' scores for the Architectural spaces of Shiraz University Libraries

Item	least	most	mean	SD	Z score	Sig.
Rate	0.1	2.98	1.86	0.67	0.84	0.49

Comparison of Architectural Spaces of Shiraz University Libraries on Eight Aspects

To compare the eight architectural dimensions at Shiraz University Library, the non-parametric Friedman test and the Wilcoxon tests were used. The results show that the hallways and service spaces are most problematic for all libraries (M= 1.43). Next comes the spaces related to nonprint materials (M= 1.69) and study halls (M= 1.7), then spaces for periodicals and dissertations (M= 2.07) and circulation desks (M= 2.01). The results from the Friedman test show that the mean rank for these aspects varies between 2.81 and 5.67. The obtained Chi-square for this test was 712.5, which is significant at a 95% level, and the differences can be generalized to the whole statistical population. The results obtained from Wilcoxon tests show that only the means of respondents' scores for the circulation desks, reference sources, periodicals, and dissertations, and the differences between nonprint materials and study halls are not significant. Still, the means for other aspects are significantly different. Table 16 illustrates these results.

Table 16

Test of significant difference in the means of "attitude toward Architectural Spaces of Shiraz

University Libraries on eight aspects" among respondents

Architectural Spaces	Numerical mean	Mean rank	Exterior	Main Entrance	Circulation desk	Nonprint materials	Reference sources, Periodicals and Dissertations	Study halls	Hallways and service spaces	Environmental issues
Exterior	1.81	4.28	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Main entrance	1.97	5.11	-7.8	-	0.01	0.000	0.000	0.000	0.000	0.007
Circulation desk	2.01	5.36	-7.5	-2.6	-	0.000	0.35*	0.000	0.000	0.001
Non-print materials	1.69	4.01	-3.6	-9.2	-2.4	-	0.000	0.8*	0.000	0.000
Reference sources, Periodicals and Dissertations	2.07	5.67	-11.7	-5.1	-0.9*	-13.3	-	0.000	0.000	0.000
Study Halls	1.7	3.89	-4.4	-11.5	-10.8	0.25*	-15.8	-	0.000	0.000
Hallways and service spaces	1.43	2.81	-14.3	-18.8	-16.3	-8	-20.5	-11.8	-	0.000
Environmental issues	1.88	4.86	-3.6	-2.67	-4	-5.8	-6.5	-8.8	-15.4	-
Sig=0.000			D.f=7				$\chi^2 = 712.5$			

Findings based on observation of library spaces and interviews with library staff Location of Shiraz University libraries

Location of Shiraz University libraries with criteria such as access, proper use of topography and land slope, the orientation of the library building with respect to the climate of Shiraz, and adequate use of light and radiation, as well as its location relative to surrounding faculties were evaluated. Table 17 shows the location of the surveyed libraries.

Table 17

Location of Shiraz University Libraries

Feature	Libraries	
easy access	Kharazmi, Central Library, and Documentation Center, Shahid Mofateh, Mullasadra, Law, Shahid Hasheminejad	
Topography and land slope	Flat	Kharazmi, Shahid Mofateh, Mullasadra, Shahid Hasheminejad
	Sloped	Central Library and Documentation Center, Faculty of Law
Location of libraries relative to surrounding colleges	Independent and visible from adjacent spaces	Kharazmi, Central Library, and Documentation Center, Shahid Mofateh
	Independent, located next to the faculty building	Mulla Sadra
	Inside the faculty building	Law, Shahid Hasheminejad
The entrance of the building uses natural light	Kharazmi, Central Library, and Documentation Center, Shahid Mofateh, Mullasadra, Shahid Hasheminejad	

Administration and Management

In all libraries, a separate space has been provided for the management and deputy sections, and the management department has easy and convenient access to other departments except for Shahid Hasheminejad Library. There is a separate space for financial, accounting, and security sections in the Kharazmi library and Central Library and Documentation Center.

Technical services department space

Among the libraries studied in Kharazmi Library, Central Library and Documentation Center, and Shahid Hasheminejad library, a relatively suitable space has been allocated for performing any technical services (including organizing resources and collection). There is a separate space in the Central Library and Documentation Center to catalog non-book sources (audio, visual and electronic resources). In Mullasadra library, all technical services are performed in a relatively suitable space. Although there is a similar space in the Law and Shahid Mofteh Libraries, the space available for staff is not up to the Standards for Iranian University Libraries (10 square meters per employee). In Central Library and Documentation Center, Mullasadra, and Kharazmi Libraries, a space has been provided for exchanging and donating resources.

Public spaces

Public service spaces such as outdoor spaces, entrances and hallways, circulation desks, nonprint materials, reference sources, study halls, welfare service spaces, and environmental considerations such as ventilation, cooling, and heating system were surveyed through observation and interviews from both the users' point of view and by the researchers. The results of the user's survey were presented in the relevant section, and the observations and interviews conducted by researchers in the discussion section were compared and discussed with the student's views.

Stacks

Collection space in almost all libraries except for Mullasadra Library was suitable for the current collection. In the Central Library and Documentation Center, and Kharazmi and Shahid Mofteh Libraries, a space was foreseen to expand the collection in the future. Adjusting the distance between bookshelves according to the standard (minimum 1 meter, maximum 2.30) was observed in the Central Library and Documentation Center, Kharazmi, and Shahid Hasheminejad Libraries.

Circulation (including connection of interior spaces for staff and clients)

In the study of the relationship between the interiors of the libraries of Shiraz University, it was observed that in all the studied libraries, the entrances of the staff and users were not separate from each other. Separate elevators and separate staircases were not designed for the transportation of equipment and library resources. The technical services and public services departments in all libraries were adequately separated. In most libraries, the relationship between different sections was straightforward and accessible. The technical services departments did not have an easy and direct connection with the circulation desk and the book stack in the central library and documentation center. The information search space and the

study hall were not directly related to the circulation desk in this library and Mullasadra library. Connection elements such as stairs and elevators are visible to users in most libraries. The position of the main entrances to all libraries is inappropriate for the disabled to enter the building. There is easy and direct access to the circulation desk and resource search area from the library entrance in most libraries.

Storage area

Suitable and sufficient space for book storage and library equipment was allocated in the central library, document center, and Kharazmi Library. There was a space for book storage in Mullasadra, Shahid Mofateh, and Shahid Hasheminejad Libraries, but there was no space for library equipment. The law library lacked a storage area.

Service and support spaces for information and communication technology

Shiraz University library servers are centrally connected to the university server. Server room connections to computer systems in all libraries are wired and annexed. Most libraries have a shared space for searching databases and other electronic resources. In the study halls of all libraries, users had access to Wi-Fi. Additional information and communication technology service spaces are shown in table 18.

Table 18

Service and support spaces for information and communication technology

Specified spaces	Libraries
Presence of a computer to search for bibliographic information resources	The space allocated for computers to search for bibliographic information of resources in all libraries except the Law Library was appropriate and separate from the main study hall. The available space was not separated from the study hall in the Law Library.
Search for electronic reference sources	There was a space for searching electronic reference resources in all libraries except Mullasadra Library. In most libraries, this space was shared with database search space.
Search for dissertations	In all libraries, there was a suitable space for a computer to search for dissertations; in the Central Library and the Documentation Center, a separate space was allocated for this purpose.
Electronic publications	There was a space for searching electronic periodicals in all libraries, most of which share the same space as the databases.
Search databases	There was a suitable space for searching databases in all libraries except Mullasadra library, but this space was shared with other electronic resources in most libraries.
Technical equipment and servers	There was a space for technical equipment and servers in all libraries.

Environmental considerations

Environmental issues at libraries were measured by three factors: ventilation, heating cooling, and light. Although most libraries have air conditioning (HVAC), some libraries cannot control temperature and humidity centrally or regionally separately, such as the Law Library, Central Library, Documentation Center, Shahid Hasheminejad, and Shahid Mofateh Libraries. It is possible to use natural ventilation in the building of all libraries except Shahid Mofateh. In all the studied libraries, daylight was used as one of the library light supply sources.

Control and security

Concerning control and security, criteria such as anti-theft system, emergency exits, fire alarm, and extinguishing system, building structure and facade, and safety and stability of information boards have been considered. Observations show that all the libraries in question are equipped with anti-theft systems. In the Central Library and Documentation Center, the section related to the collection of exquisite and rare books (due to the nature of resources) has a security system. Emergency exit is provided only in Kharazmi and Central Libraries and Documentation Center. All libraries are equipped with a fire alarm and extinguishing system. In all libraries, the architecture of the library area is designed per the natural setting. The structure and facade of all libraries are made of durable materials. Table 3 shows the safety and security points of the studied libraries.

Table 19

Control and security systems at Shiraz University Libraries

Control and security	Libraries
Anti-theft system	All studied libraries had an anti-theft system
Emergency exits	Except for Kharazmi, Central Library and Documentation Center, and Shahid Hasheminejad Libraries, there was no emergency exit in other libraries. Emergency exits in the Central Library and Documentation Center, and Shahid Hasheminejad Libraries had illuminated signs
Fire alarm and extinguishing system	All the libraries in question have a fire alarm and extinguishing system, but the fire alarm is transmitted to fire stations only in Kharazmi Library and the Central Library and Documentation Center
Structure and facade of the building	The structure and facade of all libraries are made of durable materials.
Safety and stability of information boards	Safety and stability issues for information boards in the studied libraries were observed to some extent.

Discussion

The results extracted from the survey of library users' points of view towards libraries' architectural spaces were compared with the results obtained from our observations and the interviews of the staff of those libraries. These spaces include exterior spaces, main entrance spaces, circulation desks, nonprint materials, reference sources, periodicals and dissertations, study hall spaces, hallways and service spaces, and environmental issues.

In terms of exterior spaces, users had a positive attitude towards the library's location and access to libraries, and observations from libraries confirmed the users' opinions. The location of the libraries was evaluated positively in terms of easy access and their position with the faculties and the use of natural light at the building entrance. This result shows that the opinion of students as the primary users of libraries is in line with the standards and architectural concepts in this field, so in designing and determining the location of university libraries, attention to the needs and desires of clients is of particular importance.

Concerning the location of the parking lot, the attitude of the users was entirely negative. Observations indicate that although there was a suitable parking space in different libraries,

they were more convenient and adequate for staff cars. Still, parking space for users was either not available or not enough. Users faced many problems parking their vehicles. In the opinion of users, accessibility for the disabled to enter the building is not favorable. Observations show that people with disabilities do not have easy access to libraries in most libraries and have difficulty entering libraries and accessing the upper floors. There should be a ramp with appropriate dimensions and an elevator for the disabled to access the floors. According to the standards of university libraries, there should be a unique space for disabled libraries. No special attention has been paid to this issue in the design of Shiraz University libraries.

The positive point from the users' point of view in this dimension is the visibility of the entrance of most libraries and the ease of movement in the library's main entrance. From the observations made, it is inferred that except for one case, the users know the entrance of other libraries. Although users are satisfied with the entrance space of the libraries, the observations show that, firstly, in none of the libraries is the entrance easily provided. Also, the entry and exit spaces in the three libraries are not suitable for group traffic. These results indicate the difference between users' views and architectural views in this regard. Perhaps this difference can be attributed to the fact that users usually visit libraries at different times. Because they do not visit simultaneously, there is no crowdedness, so users consider their commuting easy. While the reality is that for more people, at times of emergency, library entrances are not large enough. According to the Standards for Iranian University Libraries in terms of security, the library should have only one wide entrance and exit. Therefore, when designing, more attention should be paid to the dimensions of the library entrances. There should also be adequate emergency exit doors in all libraries.

The results show that in all libraries, users are satisfied with the condition of the circulation desk in terms of its accessibility. Still, some libraries complain about their lack of separation from the reading room, which causes inconvenience to users. The observations made by the researchers are consistent with the opinions of users. According to university libraries' standards in the university library's design, the circulation desk must be seen from the entrance door and have suitable dimensions for performing various tasks. In most libraries of Shiraz University, except for one case (Mollasadra Library), these criteria have been considered. Regarding the space for non-printed materials, users did not consider the situation favorable, but in most libraries, they were satisfied with the space allocated for searching for electronic resources. The observations also partially confirm such an attitude. Of course, in designing university libraries for studying dissertations and searching for electronic resources, appropriate and separate spaces should be designed. These spaces should be considered according to the number of clients and the necessary equipment.

The space of the reference sources in all libraries satisfied the users' needs. In some libraries, the noise of the circulation desk staff disturbed the users. Observations show that the reference resource space was appropriate in most libraries, although in some libraries, a completely separate space is provided. It is necessary to have a printing machine near non-lending sources such as reference sources, periodicals, and dissertations. The users considered the space for periodicals suitable. Observations also show that some libraries have a convenient place to store current and retrospective periodicals. According to the Iranian University Libraries Standards, besides the necessary space for keeping current and retrospective periodicals (one square meter of space for every 20 current journals), the necessary space should be provided in university libraries for the expansion of publications.

In designing university libraries, considering the growth and development of information and communication technologies, the necessary spaces for installing the necessary equipment and expanding the services required by users should be provided. It is recommended to design the library building in such a way that it has the required flexibility and changes can be made inside it according to future needs. The results of users' attitudes towards the study hall space of Shiraz University Libraries indicate that there is no possibility to adjust light independently for every desk and having a private surrounding to study in the study halls is not at a desirable level. In the user's opinion, the best indicator for the study hall was natural light. According to the standard of university libraries, it should be possible to adjust the light for each study desk. Other problems associated with the study halls are a lack of comfortable armchairs lack of eagerness to study and a sense of belonging. Observations indicate no aesthetic elements in any of the libraries under study (such as desirable furniture, proper interior architecture, and exterior view), so it can be argued that lack of enthusiasm and sense of belonging to the study hall is related to these factors. In designing the building of university libraries and their public spaces, including study halls, aesthetic factors, and factors that motivate and excite users should be considered. Also, the existence of group study halls in university libraries is necessary to create interaction between students. It is suggested that this issue be given particular importance in the design of libraries.

The results show that users in most libraries complained of noise pollution, and observations confirm this. According to the Standards for Iranian University Libraries, 2.5 square meters per person and 3 square meters per single table should be considered. According to these standards, sound reflection inside and outside should be controlled using acoustic materials and double-glazing. Users' attitudes are not positive in examining the space of hallways and welfare services. Lack of space to display new books, lack of space for drinking and a cafeteria near the library are other problems users mention. Lack of elevators or their unsuitable dimensions, especially for the physically disabled, were among the problems mentioned by users. The observations made are consistent with the users' attitudes. In most libraries, both users' views and observations indicate that a sufficient number of separate bathrooms are available.

In discussing environmental issues, the results indicate that students have not rated libraries positively in terms of heating, cooling, and air conditioning. The results of observations and interviews conducted with library staff almost confirm the opinion of users. Although most libraries have air conditioning, most spaces do not have separate temperature and humidity controls. According to the Standards for Iranian University Libraries, air conditioning in special study halls should be done twelve times an hour and should have a minimum of noise. The humidity of the tanks should be controlled between 45 and 55%, and the library should have equipment equipped with optimal and uniform heating (maximum 24 and minimum 20 degrees Celsius) in winter and summer. One of the positive points of libraries is that most of them have natural ventilation and daylight as sources of supply.

Conclusion

In the study of the architectural spaces of the libraries of Shiraz University, the results of users' attitudes and the observations and interviews conducted in different dimensions show that the position of the libraries of Shiraz University concerning the faculties is relatively good condition. In terms of exterior spaces, the biggest problem is users' parking. The main problem

seen in almost all libraries is the lack of easy access to libraries for the disabled. Inadequate dimensions of library entrances and exits, users' dissatisfaction with reading rooms, and hallways, lack of space for entertainment services, and environmental issues are other problems of libraries. According to the results obtained from users and observations, the best situation for all libraries is the space related to reference sources, periodicals, and dissertations. Except for one case (Kharazmi Library), the circulation desk space was suitable in most libraries. In the libraries under study, connection elements such as stairs and separate elevators for transporting library equipment and resources are not designed to communicate between different sections. There is an administrative and management area in all libraries. There is also a separate space for technical services, which except for two cases (Law and Shahid Mofateh Libraries) the allocated space is suitable. The current space is relatively suitable for stacks in all libraries. Still, in three libraries (Shahid Hasheminejad, Shahid Mofateh, and Mullasadra), there is no space for expanding the collection in the future. Space is provided for storage areas in all libraries except the Law Library.

Most libraries have adequate space for ICT services and support. In most libraries, a suitable space was allocated for computers to search for bibliographic information resources, electronic reference sources, dissertations, electronic publications, and Searching databases. In the study halls of all libraries, users have access to Wi-Fi. In terms of control and security, almost all libraries have safety measures, all of them are equipped with anti-theft systems, but not all have an emergency exit. The libraries in question have a fire alarm and extinguishing system, but only in two libraries is the fire alarm transmitted to the fire department. Safety points in the structure and facade of libraries and the stability of information boards in all libraries have been observed largely.

The results obtained by measuring users' attitudes, observing the subspaces of libraries, and interviewing library staff can be summarized as follows: although in designing the library building of Shiraz University, some standards have been considered, in many spaces these standards are not observed or not fully performed. In designing university libraries in each field, attention to factors such as the goals of the library, the number of users, staff and their needs, the size of the collection and its future growth and development, predicting the growth and development of information and communication technology and related equipment is essential. To provide the best services, the necessary standards should be considered in this regard.

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Endnote

1. In preparing research made questionnaire and checklist, the researchers have used many important sources, especially "Cyclopedia of Library Building and Equipment: With Emphasis on Architecture of Library Building, B. Parto, 2010".

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