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Status of Innovation in Central Libraries of Iranian Medical Universities

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Abstract

Background: Librarians need to provide innovative services to different target groups.
Objectives: This study aimed to determine the innovation status in the central libraries of Iranian medical universities.
Methods: This cross-sectional study was conducted in 2020. The study population consisted of 67 managers of the central libraries in Iranian medical universities. Data were collected using a researcher-made questionnaire whose validity was confirmed by experts; its reliability was also confirmed with an alpha coefficient of 0.98. The data analysis was performed with descriptive and inferential statistics using SPSS version 24 software.
Results: The mean innovation score in the studied libraries was 3.5 ± 0.74 in the dimension of organizational innovation and 3.2 ± 0.73 in service innovation, both of which were relatively desirable. However, the innovation level in the technological dimension was 2.7 ± 0.54, which was a relatively unfavorable situation. There were no significant relationships between gender (P = 0.88, 0.16, 0.17), age (P = 0.287, 0.708, 0.981), education degree (P = 0.561, 0.943, 0.935), work experience (P = 0.284, 0.656, 0.782), and education level (P = 0.605, 0.122, 0.033) and the types of innovation in medical libraries.
Conclusions: In the digital era, libraries need to focus on innovation, redefine their plans, do strategic planning to change their roles, and take practical steps to provide services for their users' needs.

Keywords: Innovation, Organizational Innovation, Service Innovation, Technological Innovation, Medical Libraries

1. Background

Organizations, as social institutions, need innovation to prevent the harmful consequences of environmental changes. By creating transformative strategies, innovation can lift organizations out of recession and embrace the change itself before it surprises them (1). Rapid advances in information and communication technology (ICT) have brought global change and affected every aspect of life. Extensive social, cultural, and economic changes due to rapid advances in information technology have also affected universities and libraries (2). Academic libraries operate in higher education and play a key role in developing and promoting science. A significant part of the educational and research needs is met in university libraries. Therefore, researchers who visit these libraries expect those in charge to provide innovative services (1).

On the other hand, innovation helps academic libraries meet the needs of their clients, both now and in the future (3). The desire to change academic libraries' environment, services, and facilities is now necessary to support the universities' educational, learning, and research activities; otherwise, academic libraries will lose their true identity in the new information era (2). Librarians also need to provide innovative services to reach different target groups. They must adopt new technologies, manage existing collections, and select quality resources distributed in various libraries, archives, and knowledge centers. By using new services, academic libraries gain the trust of their clients (3).

There are different types of innovation, and several authors have examined it from different perspectives. Types of innovation include product, process, administrative, service, organizational, managerial, technological, technical, strategic, and so on. Most researchers divide innovation into four categories: Office innovation, production innovation, process innovation, and technological innova-

tion (4). Trott, a researcher in innovation management, divides the concept into the following categories: Product innovation, process innovation, organizational innovation, managerial innovation, production innovation, business-marketing innovation, and service innovation (5). Innovation in libraries is the process of creating an idea and turning it into a better service for library users (6).

In their research, Webster and Barahmand concluded that close collaboration enables libraries to take their services to new levels. These partnerships are the key to ongoing innovation for these services (7). Awais and Ameen, as cited in Taylor, asserted that in the coming years, the use of libraries would be limited to specific purposes, so it is essential that libraries adapt to innovation (6). Another study showed that most officials do not listen to users' concerns about the poor quality of library services, which is a strong reason for the failure of academic libraries (8). This requires serious attention to service innovation. The innovation process is also hidden from the eyes of librarianship and information researchers, or it indicates a poor state of innovation in libraries (1). As Dechamkhoy et al. stated, due to the growing importance of innovation in organizations, university libraries have also earned special importance in this regard. In their research, they concluded that managers know the rate of administrative innovation more than employees of public and technical services (9). Therefore, attention to innovation in different sections of academic medical libraries seems necessary (9, 10).

Due to changes in medical sciences and emerging new information resources, the performance of academic medical libraries and the role of their staff must also be changed based on new information needs. They must provide new and innovative services regarding the change in ICT. Medical librarians can provide a pleasant work environment (11) and contribute new roles in medical journalism, scientometrics, and research management (12), acquisition of new medical resources and databases, medical archiving, using economic models of publications for books and journals, data science, data sharing, and educating users in medical libraries. In this regard, previous research has either modeled innovation in libraries (13) or examined the relationship of information and knowledge management models and knowledge sharing with levels of creativity and innovation (14, 15). In contrast, limited studies have considered innovative strategies for improving the performance of academic medical libraries in Iran.

2. Objectives

This study aimed to determine the status of innovation in the central libraries of medical universities.

3. Methods

This applied cross-sectional study was performed in 2020 through a quantitative research method. The study's statistical population included all managers of medical, scientific resources, and information departments (67 persons) in the central libraries of medical sciences universities in Iran. Around 65 (97%) people participated in this study. The research tool was a questionnaire that contained demographic information (seven questions) and 82 questions about organizational (29 questions), service (21 questions), and technological (32 questions) innovation. The researcher designed the research questionnaire based on the literature review and principles of questionnaire design. It was designed based on studies by Dechamkhoy et al. (9) and Sayfi (16) to collect managers' opinions on the state of innovation in the central libraries of medical sciences universities in Iran. Since the questionnaire used in this study was made by the researchers, to determine the content and face validity, we gave the questionnaire to the professors of the medical library and information departments at Isfahan, Shahid Beheshti, and Iran Universities of Medical Sciences. After receiving their comments, the questionnaire was revised. In this study, Cronbach's alpha method was used to calculate the reliability of the questionnaire, the value of which was 0.968. The questionnaire had the necessary reliability as Cronbach's alpha coefficient was greater than 0.7.

Scoring for each item was done on a five-point Likert scale from very high to very low (very high = 5, high = 4, somewhat = 3, low = 2, and very little = 1) by which three types of organizational innovation, service innovation, and technological innovation were measured. The data were analyzed using descriptive (frequency, mean, and standard deviation) and inferential statistics (Kolmogorov-Smirnov, independent *t*-test, Mann-Whitney, Kruskal-Wallis) through SPSS version 24.

4. Results

Of the 65 participants, 66.2% were women, and 33.8% were men. The highest frequency belonged to the age group of 31 - 37 years. All managers were over 30 years old, and only one was under 30. Concerning education, 13.9% of the respondents had a bachelor's degree, 61.5% had a master's degree, and 24.6% had a doctoral degree. Among 65 respondents, 12.3% had less than five years of experience, 16.9% had 5 to 10 years, and 70.8% had more than 10 years. Table 1 shows the status of innovation in the studied libraries.

The mean organizational innovation score was 3.5 ± 0.74. The items "Senior library officials support training

Table 1. The Status of Innovation in the Studied Libraries

Items	Minimum	Maximum	Mean ± SD
Organizational innovation	1.3	5.0	3.5 ± 0.74
Service innovation	1.0	4.7	3.2 ± 0.73
Technological innovation	1.1	4.5	2.7 ± 0.54
Total	1.0	5.0	3.1 ± 0.81

courses to increase librarians' creativity" (4.09 ± 0.95), "The library uses the results of creativity and gives appropriate rewards to creative and innovative people" (3.97 ± 1.00), "Granting funding for library projects has increased the motivation of librarians" (2.95 ± 1.25), "Library staff is committed to their goals and tasks" (3.94 ± 0.88), and "The library organization, along with respecting old ideas and practices, allows people to change and evolve" (3.94 ± 0.88) had the highest mean scores. Also, the items "With the change in the goals and policies of the library organization, a new organizational structure, job titles, and new organizational positions have been created" (2.72 ± 1.11), "Research and development activities in the library have diversified" (3.55 ± 1.21), "Extra-organizational communication of the library has expanded" (3.18 ± 1.04), and "Strength, weakness, opportunity, and threat (SWOT) is used in evaluating library processes and activities" (3.26 ± 1.08) had the lowest mean scores in organizational innovation.

The mean score of service innovation was 3.2 ± 0.73 (Table 1). The items "Library manager and staff have a positive view of service innovation" (4.18), "Library can modify or change current service approaches to meet the needs of users" (3.86 ± 1.04), "The library is constantly looking for new ways to provide services to users" (3.82 ± 1.03), "The library manager helps staff to perform their duties and provide new services to users appropriately by training new capabilities and skills" (3.82 ± 1.03), "Library management has a special emphasis on service innovation" (3.80 ± 0.89), and "Library predicts the future needs of users and analyzes changes in the environment, and accordingly develops new services" (3.80 ± 0.95) had the highest mean scores. Moreover, the items "In the library, the possibility of cinema screening or cinematic storytelling is provided" (1.43 ± 0.83), "Book and gift shops/prize (book) in the library" (02.02 ± 1.05), "Weekend educational-service programs have been prepared in the library" (2.03 ± 1.07), "In the library, access to all types of electronic files based on iPod/iPhone/iPad, and smartphones is provided" (2.31 ± 1.38), and "It is possible to create laboratories and learning rooms and digital media laboratories" (2.32 ± 1.29) had the lowest mean scores in service innovation.

The mean score of technological innovation was 2.7 ± 0.54. The items "Wi-Fi service is available to users in all parts of the library" (4.03 ± 1.30), "Digitization services and online access to catalogs are provided for university-affiliated users" (4.03 ± 1.26), "Librarians use advanced technology tools in information activities" (3.48 ± 0.97), "The library uses new technologies to increase the quality and effectiveness of services by transforming existing programs and services into different formats" (3.46 ± 1.05), and "Library develops new technologies to improve quality and reduce costs" (3.45 ± 1.05) had the highest mean scores. Also, the items "In the library, information is provided to users through online games or games" (1.74 ± 0.97), "In the library of Cafe Danesh, there is information to serve along with food" (1.74 ± 1.11), "Library cooperation with knowledge-based companies and launching startups, purchasing modern devices from innovative companies, and purchasing patents and licenses have provided the ground for innovation research and development" (1.77 ± 1.06), "By directing research towards innovation and commercialization of research, whether in the form of a license or a product and service and modeling of emerging innovations, the library manager provides the basis for the formation of an innovation system in the library" (2.03 ± 1.03), and "The use of cloud computing space, big data, and artificial intelligence to provide services in the library" (1.80 ± 1.03) had the lowest mean scores.

Using the Kolmogorov-Smirnov test, the sum scores of service innovation and technological innovation were normal, but the sum scores of organizational innovation were non-normal. There was no significant difference in the mean scores of service innovation between women and men using the independent samples *t*-test (P = 0.16). Also, there was no significant difference in the total mean score of technological innovation between men and women using the independent samples t-test (P = 0.17). The sum scores of organizational innovation using the Kolmogorov-Smirnov test were not normally distributed, so the Mann-Whitney test found that the mean scores of organizational innovation were not significantly different between men and women (P = 0.88) (Table 2).

To investigate the relationships between educational degrees and organizational innovation, service innovation, and technological innovation, first using the Kolmogorov-Smirnov test, the normality of the above variables was examined at the education level. Organizational innovation was not normal, but service innovation and technological innovation were normal. Through analysis of variance (ANOVA), the mean scores of technological innovation were not statistically different between different education levels (P = 0.93). Also, the mean scores of service innovation were not statistically different between different education levels at P = 0.94 (the variance of the variables was the same at different educational levels).

Table 2. Significance Levels of Organizational Innovation, Service Innovation, and Technological Innovation in Kolmogorov-Smirnov, Independent Samples *t*, and Man-Whitney U Tests by Gender of Respondents

Gender	Kolmogorov-Smirnov Test			Mann-Whitney U or Independent *t*-test	
	Frequency	P-Value	Mean ± SD	P-Value	Inferential Test
Organizational innovation				0.88	Mann-Whitney U
Male	22	0.200	3.5 ± 0.85		
Female	43	0.018	3.6 ± 0.46		
Service innovation				0.16	Independent samples *t*-test
Male	22	0.200	3.1 ± 0.80		
Female	43	0.200	3.3 ± 0.48		
Technological innovation				0.17	Independent samples *t*-test
Male	43	0.20	2.6 ± 0.79		
Female	22	0.20	2.8 ± 0.59		

Using the nonparametric Kruskal-Wallis test, it was found that there was no significant difference in organizational innovation between different educational levels at P = 0.56 (Table 3).

To examine the relationships between age and organizational innovation, service innovation, and technological innovation, first, the Kolmogorov-Smirnov test was run to examine the normality of the variables at age levels. Organizational innovation and service innovation were not normal, but technological innovation was normal. The analysis of variance showed that the mean scores of technological innovation were not statistically different between different age levels at P = 0.98 (The variance was the same at the age levels). There was no significant difference in organizational innovation and service innovation between different age levels, as shown by the Kruskal-Wallis test (P = 0.24 and P = 0.89, respectively) (Table 4).

To examine the relationships between service history and organizational innovation, service innovation, and technological innovation, the Kolmogorov-Smirnov test was run to check the above variables at the service history levels. Organizational innovation and service innovation were not normal, but technological innovation was normal. The analysis of variance showed that the mean scores of technological innovation were not statistically different between different levels of service history at P = 0.78 (The variance was the same at the different levels of service history). Using the nonparametric Kruskal-Wallis test, there was no significant difference in organizational innovation and service innovation between different levels of service history (P = 0.28 and P = 0.36, respectively) (Table 5).

To examine the relationships between education levels and organizational innovation, service innovation, and technological innovation, first, the Kolmogorov-Smirnov test was run to check the normality of the above variables at the education levels. Organizational innovation and service innovation were not normal, but technological innovation was normal. The analysis of variance showed that the mean scores of technological innovation were not statistically different between different education levels at P = 0.033 (The variance was the same at the different education levels). Using the nonparametric Kruskal-Wallis test, there was no significant difference in organizational innovation and service innovation between different education levels (P = 0.58 and P = 0.108, respectively) (Table 6).

5. Discussion

The results of this study showed that organizational innovation in the central libraries of medical universities, with an average score of 3.5, was at a relatively desirable level. In the study of Dechamkhoy et al., the mean score of organizational innovation was 3.42 (9). In the present study, the mean score was 3.5, showing similar results.

In the study of Dechamkhoy et al., the item "The use of new facilities and equipment has led to the effective improvement of library activities" had the highest average score, and the item "Library research and development activities are diverse" had the lowest mean score. However, in the present study, the item "Senior library officials support training courses to increase librarians' creativity" had the highest average, and the item "By changing the goals and policies of the library organization, new organizational structure, job titles, and new organizational positions" had the lowest score (9). In another study, Jantz regarded leadership as an important factor for organizations to innovate. Librarians are concerned about accepting the risk of innovation. Although management and leadership can foster innovation in libraries, other factors influence innovation, including organizational aspects, organizational environment, complexity, and organizational size (17). In the present study, "Senior librarians support training courses to increase librarians' creativity" had the high-

Table 3. Significance Levels of Organizational Innovation, Service Innovation, and Technological Innovation in Kolmogorov-Smirnov, Independent Samples *t*, and Man-Whitney U Tests by Educational Degrees of Respondents

Degree	Kolmogorov-Smirnov Test		ANOVA or Kruskal-Wallis test	
	P-Value	Mean ± SD	P-Value	Inferential Test
Organizational innovation			0.561	Kruskal-Wallis
Medical Librarianship	0.019	3.6 ± 0.58		
Librarianship	0.001	3.6 ± 0.79		
Other majors	0.200	3.3 ± 0.47		
Service innovation			0.943	ANOVA
Medical Librarianship	0.200	3.2 ± 0.45		
Librarianship	0.200	3.2 ± 0.81		
Other majors	0.080	3.0 ± 0.62		
Technological innovation			0.935	ANOVA
Medical Librarianship	0.200	2.6 ± 0.55		
Librarianship	0.200	2.7 ± 0.80		
Other majors	0.200	2.6 ± 0.71		

Table 4. Significance levels of Organizational Innovation, Service Innovation, and Technological Innovation in Kolmogorov-Smirnov, Independent Samples *t*, and Man-Whitney U Tests by the Age of Respondents

Age	Kolmogorov-Smirnov Test		ANOVA or Kruskal-Wallis test	
	P-Value	Mean ± SD	P-Value	Inferential Test
Organizational innovation			0.287	Kruskal-Wallis
31 - 37	0.200	3.5 ± 0.48		
38 - 44	0.200	3.5 ± 0.77		
Above 45	0.002	3.6 ± 0.84		
Service innovation			0.708	Kruskal-Wallis
31 - 37	0.200	3.2 ± 0.52		
38 - 44	0.200	3.2 ± 0.78		
Above 45	0.032	3.1 ± 0.82		
Technological innovation			0.981	ANOVA
31 - 37	0.200	2.7 ± 0.72		
38 - 44	0.200	2.7 ± 0.67		
Above 45	0.200	2.6 ± 0.82		

Table 5. Significance Levels of Organizational Innovation, Service Innovation, and Technological Innovation in Kolmogorov-Smirnov, Independent Samples *t*, and Man-Whitney U Tests by the Work Experience of Respondents

Work Experience	Kolmogorov-Smirnov Test		ANOVA or Kruskal-Wallis test	
	P-Value	Mean ± SD	P-Value	Inferential Test
Organizational innovation			0.284	Kruskal-Wallis
Less than 5	0.200	3.3 ± 1.00		
5 - 10	0.042	3.5 ± 0.50		
Above 5	0.003	3.6 ± 0.74		
Service innovation			0.656	ANOVA
Less than 5	0.200	3.2 ± 0.92		
5 - 10	0.200	3.0 ± 0.51		
Above 5	0.052	3.2 ± 0.73		
Technological innovation			0.782	ANOVA
Less than 5	0.200	2.7 ± 0.89		
5 - 10	0.200	2.5 ± 0.73		
Above 5	0.200	2.7 ± 0.72		

Table 6. Significance Levels of Organizational Innovation, Service Innovation, and Technological Innovation in Kolmogorov-Smirnov, Independent Samples *t*, and Man-Whitney U Tests by Education Levels of Respondents

Education	Kolmogorov-Smirnov Test		ANOVA or Kruskal-Wallis test	
	P-Value	Mean ± SD	P-Value	Inferential Test
Organizational innovation			0.605	Kruskal-Wallis
BA/BSc	0.200	3.5 ± 0.38		
MA/MSc	0.001	3.4 ± 0.83		
Ph.D.	0.200	3.7 ± 0.62		
Service innovation			0.122	ANOVA
BA/BSc	0.200	2.7 ± 0.43		
MA/MSc	0.057	3.3 ± 0.77		
Ph.D.	0.200	3.5 ± 0.62		
Technological innovation			0.033	ANOVA
BA/BSc	0.151	2.4 ± 0.51		
MA/MSc	0.200	2.5 ± 0.73		
Ph.D.	0.200	3.1 ± 0.75		

est average. This finding is also consistent with Scupola and Westh Nicolajsen (18) study.

Regarding service innovation, the central libraries of the country's medical universities were at an average level, with an average score of 3.2. The item "Library manager and staff have a positive view of service innovation" had the highest mean score, and "In the library, it is possible to show movies or cinematic storytelling" had the lowest average in service innovation. Makkizadeh et al. also compared the innovation in specialized university libraries and stated that the level of innovation in university libraries was lower than that of the specialized libraries of the Cooperative and Radio and Television Organization (19). This result is consistent with the present study.

Regarding technological innovation, the level of innovation in the central libraries of the country's medical universities, with an average score of 2.7, was below average (a relatively unfavorable situation). This result is consistent with Awais and Ameen's study. In Awais and Ameen's study, although the majority (85%) of university libraries accepted the innovations, only 15% of the libraries across Pakistan were relatively better on the innovation acceptance scale (6).

According to the research results, the scores of organizational and service innovation in the library were not in good condition (with an average of 3.5 and 3.2, respectively), especially technological innovation (2, 5). In the present era, users meet most of their needs and services by using technologies. Therefore, it is worthwhile for officials and policymakers to plan and act in this regard. Librarians must also constantly seek creative approaches to service delivery, provision of scientific resources, use of new technologies and information resources, and work together to provide services and innovation. In the digital age, libraries must redefine their plans, apply action planning to change their roles, recognize the types of innovations, and use them to develop their organization's goals and success. Library administrators must also consider the type and nature of library services and use different formats to provide services to stay in touch with their users.

Regarding organizational innovation, library managers can have the greatest impact on implementing the innovation process. Therefore, creative and innovative managers should be selected, and innovative managers should be supported so that this becomes an organizational culture. In this section, according to the results, the least innovation score was related to the lack of change in the organizational structure, job titles, and organizational positions simultaneously with changing goals and policies. This clearly shows that although the environment and organization the library depends on are changing, the library and its objectives do not change simultaneously and are unwilling to accept innovation. This can lead to a gap between the needs of the parent organization and the main goals of libraries, and as a result, the role of libraries in the parent organization is diminished.

Regarding service innovation, managers and employees have the greatest impact on innovation. The research results in service innovation showed that the item "Library can modify or change current service approaches to meet the needs of users" had the highest average after the item "Library managers can have the greatest impact on implementing the innovation process."

It can be concluded that although librarians and administrators are constantly looking for innovation, the levels of innovation are still moderate and low. The reason for these issues must be sought in the barriers to innovation.

The results also showed that the possibility of cinematic screening or storytelling had the lowest average among other components. This indicates that quiet space is still important in libraries and that users' needs for mental rest and activities to reduce reading difficulties are not considered. Other service innovations that have received less attention include establishing bookstores and gift/prize (book) stores in the library, providing weekend service training programs in the library, and establishing laboratories, science learning rooms, and digital media labs in libraries.

Considering technological innovation, which had the lowest score of innovation in the present study, officials should pay special attention to this dimension of innovation because, in the era of information technology, library users meet most of their needs in the context of technology; therefore, libraries need to keep this in mind in order to retain their users. Because the present study was performed on managers, and some questions may have been self-assertive and biased, caution should be exercised in generalizing the results.

5.1. Conclusions

The lowest innovation score was related to technological innovation, so it is recommended that the authorities plan and take action to increase technological innovation in library services. In order to be successful in implementing the innovation process, which can provide services tailored to users' needs, the relevant authorities must look at the innovation as an operational plan. Therefore, they should avoid a superficial view of creativity and innovation in the organization. Levels of organizational innovation and service innovation were also moderate. It is recommended that officials have operational planning to promote organizational and service innovation. Also, in the process of library management, creative people interested

in innovation should be given priority in attracting and cooperating with others. It is recommended that authorities value staff's creative and innovative ideas and processes at different levels of libraries and organizations.

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Footnotes

Authors' Contribution: The research was conceptualized by LN and RAB and NS. Data collection was done by RAB and analyzed by MR. All authors contributed to the article's writing and approval.

Conflict of Interests: The authors declared that they had no competing interests regarding research support, employment, personal financial interests, shares in companies, consultation fees, and other probable interests.

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