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Original Research

Public Library Makerspace in Iran: A Qualitative Study on Components and Advantages

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Abstract

Libraries need to be innovative and creative to prevent a recession. As a forum for idea-making, the makerspace guarantees library dynamics and user satisfaction. This study aimed to identify the necessary factors and advantages of establishing makerspace in Iran's public libraries. This qualitative study applied A semi-structured interview as a data collection tool. The questions guiding the interviews were extracted from related literature. Content analysis was used for analyzing the data from interviews with 14 purposefully-selected public library managers. Software and hardware factors were identified as the main components for implementing makerspaces in Iran's public libraries. The main advantages of implementing makerspaces in Iran's public libraries were library services, technologies, buildings and physical evidence, and librarians and users. Each of the components has its own subcategories and related items. The consideration of elements necessary for implementing library makerspaces, plus informing about the advantages of establishing such a milieu, can be lucrative to library managers and librarians in making the library a dynamic environment for its users.

Keywords: Creativity, Innovation, Iran, Makerspaces, Public Libraries, Infrastructure.

Introduction

The rapid and comprehensive changes occurring worldwide necessitate organizations to be adaptable and evolutionarily. This requires innovation and creativity (Singh, Gupta, Busso & Kamboj, 2021). Libraries need to escape their stagnant state by establishing a forum for innovative thinking and fostering a creative environment in their space (Brady, Salas, Nuriddin, Rodgers & Subramaniam, 2014). Libraries are responsible for providing primary sources for innovative and creative thinking, i.e. information resources, and facilitating opportunities for creativity by removing obstacles (Gupta & Rubalcaba, 2022). A new concept for fostering innovation and creating a creative atmosphere in libraries is makerspaces, which enable library users to be more involved and actively cooperate in library processes. Individuals convene in these traditional workspaces to create, learn, and innovate. Makerspaces are adaptable settings for communication, interaction, and education. The initial makerspace came into existence in Germany in 2005, located across three separate areas. Subsequently, up until 2014, 1500 makerspaces were created globally (Michalak & Rysavy, 2019).

Makerspaces can be established in various settings, such as schools, educational centers, public and private organizations, and public libraries. These spaces typically have minimum tools, including educational software packages and three-dimensional printers. Initial training is provided to assist individuals in using these tools to create new products. A local network of interest groups is also formed to design new products and add value. The primary indication of these spaces is a concept entrenched in setting the objective to create using minimal resources available and abstaining from mere consumption. In such spaces, networking and training take precedence over existing tools. The ethos of these spaces revolves around sharing, problem-solving, and generating added value by applying new technologies to produce novel items. Three key components of makerspaces are access to essential equipment, instruction on using digital and physical tools, and opportunities for networking and sharing knowledge (Kim & Copeland, 2021).

There is a lack of research into the potential development and application of makerspaces in Iran. Nonetheless, certain establishments such as start-ups, rapid prototyping centers in science and technology parks and universities, gaming workshops in schools, and children's education centers could be considered makerspaces in a broader sense. However, these instances are restricted to specific circumstances and periods. Introducing makerspaces in public libraries can enhance library services, attract and retain active users, engage silent users, and address the user crisis. Nevertheless, administrators of public libraries in Iran have inadequately implemented makerspaces. This study endeavors to ascertain the required components and benefits of implementing makerspaces in public libraries in Iran.

Literature Review

Introducing makerspaces into public libraries can enhance the acquisition of diverse skills and technologies for library users whilst expanding services and facilities (Slatter & Howard, 2013). Therefore, it is common for public libraries to establish makerspaces to foster lifelong learning and literacy among their patrons (Davis, 2018). Furthermore, makerspaces have the potential to enhance the perception of library services while also transforming the aspirations of users into tangible creations. By facilitating practical learning and providing opportunities for innovation and the development of individual life skills (Hynes & Hynes, 2018), makerspaces offer interactive and collaborative environments in which users can share their

knowledge and pursue their interests in creating new artifacts (Michalak & Rysavy, 2019). By facilitating practical learning and providing opportunities for innovation and the development of individual life skills (Hynes & Hynes, 2018), makerspaces offer interactive and collaborative environments in which users can share their knowledge and pursue their interests in creating new artifacts (Michalak & Rysavy, 2019). By facilitating practical learning and providing opportunities for innovation and the development of individual life skills (Hynes & Hynes, 2018), makerspaces offer interactive and collaborative environments in which users can share their knowledge and pursue their interests in creating new artifacts (Michalak & Rysavy, 2019). Makerspaces have the potential to transform the conventional perception of libraries into innovative interactive areas, which foster collaborative settings for discovering novel ideas and acquiring fresh knowledge (Li & Todd, 2019).

The significance of library makerspaces for children and teenagers lies in their capacity to lure them towards these facilities by creating dynamic spaces for enjoyment and education where real-life teamwork can occur. Practical skills and hidden interests can be discovered within innovative makerspaces (Skåland, Arnseth & Pierroux, 2020). The services provided by the library makerspace have experienced a limited progression. For example, in Turkey, public libraries only offer one service and do not entirely embrace the maker philosophy (Güneş & Canatar, 2022). Students are an important group, and makerspaces can greatly help cultivate their creativity. One study explored children's assessments of their activities and experiences in a public library makerspace during after-school and school visits. Children reported many experiences of making (maker skills, creativity) and maker attitudes (motivation, perseverance, confidence). Experiences with collaboration (helping each other) were mentioned to a lesser extent (Pijls, van Eijck, Kragten, & Bredeweg, 2022). Makerspaces have high capabilities in implementing game-based training. The recent study combined game-based learning with augmented reality tools to develop a novel game-based navigation system, which provided an innovative and effective learning tool suitable for the characteristics of makerspace and contributed to promoting makerspace user education and diversified learning modes (Chen & Yang, 2023).

As makerspaces are a newly emerging research topic within the library domain, this novel concept requires extensive global and domestic consideration from diverse perspectives.

Research Questions

1. What are the constituent structures of makerspaces for implementation in public libraries from the perspective of the main stakeholders?

2. What are the advantages facing public libraries in implementing constructive spaces from the perspective of the main stakeholders

Materials and Methods

This study is a qualitative exploration that took purposeful sampling based on some inclusion criteria for reaching data saturation as noted by This study is a qualitative exploration that took the purposeful sampling based on some inclusion criteria for reaching data saturation as noted by Holloway and Wheeler (2002) and Burns and Grove (2005). Fourteen specialist public library managers in Iran were included for interviewing on the intended concepts. The main criterion of inclusion was the participants' familiarity with makerspaces and their implementation in public libraries.

A semi-structured interview with an interview guide and some open-ended questions was used for data collection. The main axis and questions guiding the interviews were extracted from related literature. Data analysis and codification were done simultaneously to achieve new knowledge from raw data in qualitative content analysis, as explained by Boström, Isaksson, Lundman, Graneheim, and Hörnsten (2014). By re-hearing the participants' descriptions, the main concepts were obtained. At first, interviews were reviewed line-by-line for coding. Out of 800 initial codes, some specific codes or categories were extracted by deleting repeated and merging similar initial codes. Then, these codes were revised, amended, refined, and compared to decrease existing subcategories and develop some broader related subjective categories.

To respect participants' rights, telephone contact was made with individual participants before interviewing them to explain the aims and approach of the study and obtain their consent. All interviews were recorded, transcribed, typed, and coded individually. A four-minute-duration video clip on the concept of makerspaces for better interaction was sent to them via e-mail. The interview was 30-75 minutes based on participants' information, interests, and tendency. Data collection continued until no new information was obtained through interviews, and the data reached saturation.

Research validity and reliability were obtained by four components: credibility, conformability, dependability, and transferability. Credibility and data accuracy were confirmed with appropriate and positive long-term interactions with interviewees, plus deep and long-term floating-in data. For confirmability, all activities and decisions were recorded for possible presentation and some experts revised the codes. Data were fully and deeply described for the transferability or significance of findings for others in similar states.

Results

In this study, based on the results obtained from coding, summarizing, and classifying them, as well as the repetition of most themes in the final interviews, the researchers concluded that the information reached saturation after conducting 14 interviews with nine managers and five librarians. Therefore, the sampling reached its completion. The participants expressed their willingness to participate in this study individually and before the interviews. The interviews ranged from 30 to 75 minutes, depending on the participants' tolerance, information, interest, and willingness.

One of the most substantial and primary factors in establishing makerspaces in public libraries in Iran is understanding the necessary components for implementing these spaces in public libraries. Hardware (with four subcategories) and software (with seven subcategories) factors were the two main components of implementing makerspaces in public libraries, which the participants in the study mentioned in different ways in their discussions (Table 1).

Table 1

Components and items needed for establishing makerspaces in Iran's public libraries

Theme	Components required for implementing makerspaces in Iran's public libraries			
Category	Hardware factors		Software factors	
Subcategory	Physical Evidence	▪ Providing ergonomic desks and tables ▪ Providing education-assisted tools such as three-dimensional printers, projectors, televisions,	Technological infrastructure	▪ High-speed free internet ▪ Smart systems and robots for optimized searches

		etc. ▪ Preparing enough requirements needed by users ▪ Providing enough computer systems ▪ Providing other requirements		
	Educational resources	▪ Preparing needed educational content and pre-designed workshops for users ▪ Using both electronic and printed educational resources ▪ Assigning enough budget for purchasing necessary contents ▪ Preparing appropriate resources for housework women referring to the library as a makerspace	Regulations and Policies	Ranking librarians based on their innovation and creativity
	Physical space	▪ Preparing necessary physical items such as lighting and acoustics ▪ Standardization of library space ▪ Making a constructive and encouraging inner environment	Time management	▪ Change the library open time for best use in making makerspaces ▪ Optimized use of user time in the library
	Human and financial resources	Appointing innovative and motivated expert librarians	Access to resources	Access to subscribed databases for fulfilling user needs
			Education and professionalism	Purposeful training for librarians
			Idea making	Human networking by collecting ones full of new ideas
			Positive motivation among librarians	Branding and marketing library products by encouraging managers and librarians

The participants referred to equipment, appropriate educational resources, physical space, and resource management (human and financial) as hardware factors in line with the necessary components for implementing makerspaces. Providing suitable desks and chairs, acquiring teaching aids, using sufficient equipment according to users' needs, acquiring enough and appropriate computer systems, acquiring necessary tools and equipment for setting up the makerspace, preparing educational content tailored to users' needs, providing electronic information resources alongside print resources, having a sufficient and necessary budget for purchasing informational resources, preparing informational resources suitable for matrons visiting the makerspace, paying attention to essential environmental factors related to the location, standardizing library spaces, focusing on revitalizing and creating a pleasant environment in the physical space, utilizing library and information professionals, and having

creative and motivated resource management (human and financial) were the perspectives of the participants.

As one of the respondents (M4) said, "The presence of a creative space can promote the prosperity of public libraries, so attention should be paid to implementing such a space. We need a space that satisfies the users in every aspect and makes them feel comfortable being in the creative space, such as providing comfortable and suitable tables and chairs for group discussions, education, and entertainment."

According to the research participants, a maker space has numerous benefits for libraries, especially public libraries. These include improving services (with two subcategories), enhancing technology (with three subcategories), renovating and updating buildings and equipment (with two subcategories), and enhancing librarians' skills (with two subcategories). Table 2 depicts the related categories, subcategories, and items.

Table 2

Components found as advantages of establishing makerspaces in Iran's public libraries

Theme	Advantages of implementing makerspaces in Iran's public libraries						
Category	Services		Technologies	Facilities and building		Librarians and users	
Subcategory	Promoting Public services	Welfare services	Educational services	Renewing library building and architecture	User-oriented physical design	Promoting general skills	Technology-based literacy
		Social services			User-friendly rooms and departments		Digital literacy
		Cultural services	Newly-emerged communicative services		Coordination of building with changeable technologies		Innovation and creativity
	Promoting professional services	Information services					Librarians' communicative skills
		Educational services					Identifying users' talents
		Research services		Renewing library facilities	Internet	Promoting professional skills	Educational, professional, and research skills
			Technology-based information services		Computer		
					Replacing library facilities with updated one		Information literacy skills

One of the benefits of implementing a makerspace is the improvement of public and specialized services. According to the participants' statements, welfare, social, and cultural services have constituted the foundation of enhancing public services. Another advantage of implementing a maker space in public libraries is the enhancement of specialized services by informational, educational, and research services.

Discussion

The makerspace helps public libraries in dynamic environments. Identifying the practical components in making such spaces is essential in promoting library services and outreach. Establishing makerspaces in libraries of all kinds needs a budget and managers with skills to

better use the budget for making these spaces (Wong & Partridge, 2016). As attractive physical spaces are at work in creating appropriate makerspaces in libraries, an absorbing and constructive space is needed in public libraries. Some studies emphasize the importance of standardized areas for implementing library makerspaces (Kim, Jung & Choi, 2022). We found such items in this study, too. As highlighted in previous studies, library managers should provide enough software and hardware packages and needed infrastructures for maximum-level attraction for user members (Britton, 2012; Litts, 2015).

As standardized physical spaces are essential indicators in implementing makerspaces due to their role in preparing a set for applying better facilities and services, library managers should have a powerful vision and knowledge of library design, infrastructure, and architecture. Andrews, Wright, and Raskin (2016) emphasized the notion, too. As librarians interact with direct contact with users and are the main role-players in making and preserving library makerspaces, they should obtain basic skills in this regard. Boyle et al. (2016) and Williams and Willett (2019) confirmed the necessity of such special skills for librarians.

As software infrastructure is at work in satisfying user needs, setting regulations, administering applications, accessing free internet, and using intelligent systems for handling advanced searches can help increase user satisfaction and make dynamic makerspaces in public libraries. In some previous studies, such factors have been emphasized (Kurti, Kurti & Fleming, 2014; Peppler & Bender, 2013; Radniecki, 2018). Participants suggested a ranking system for librarians based on their motivated involvement in innovative and creative activities in makerspaces. This finding accords with that of Huvila (2020). However, this is a crucial gap in the current status of Iran's public libraries.

As suggested in the category of time management, changes and flexibility in the library's open hours can improve users' active participation in makerspaces and stimulate silent or busy users to involve in innovative activities. Providing the possibility of 24-hour activities in a public library can absorb the attention of users who have limited free time.

Access to subscribed databases for fulfilling user information needs helps make active makerspaces as there is a variety of user groups in public libraries who need different consultations and have various research interests, information needs, and retrieval systems. Wynn, Oyeyemi, Budrionis, Marco-Ruiz, Yigzaw, and Bellika (2020) argue that such high-quality research and information services make users more dependent on the library. As the participant suggested, branding and marketing library services by motivating and training library managers and librarians are the main factors in establishing library makerspaces. Since the implementation of makerspaces needs skillful librarians full of motivation and positive attitudes, librarians should change their perspectives and behaviors and consequent decisions. Gall (2012) and Vongkulluksn, Matewos, and Sinatra (2021) noted the importance of librarians' beliefs in and motivations for continuously developing library makerspaces.

Participants focused on library services and organizational performance, considering the advantages of makerspaces in public libraries. Positive changes in managerial procedures and organizational structures tend to foster library services' variety and reach and form a dynamic makerspace, as Koul, Sheffield, and McIlvenny (2021) noted. Implementing technology in public libraries was identified as one of the main components of makerspaces. Its logical and innovative application fulfills user needs, develops innovative learning opportunities, and reaches intended missions and goals. Oliver (2016) and Ejikeme and Okpala (2017) emphasized the necessity of introducing new technologies into libraries.

One of the advantages of implementing makerspaces in public libraries is the changes to be made in the library building and physical design. Makerspaces necessitate some user-friendly changes in the library architecture. In addition, renewing library facilities is an advantage that can absorb active users and increase their satisfaction. The factor was emphasized in previous studies (Nichols, Melo & Dewland, 2017; Saorín, Melian-Díaz, Bonnet, Carrera, Meier & De La Torre-Cantero, 2017). Promoting the technology-based literacies of librarians and users is another component suggested as an advantage in implementing makerspaces in public libraries.

Librarians are the main role-players in administrating active makerspaces in their libraries. Makerspaces can help librarians to be more innovative and creative in training users and awareness of modern information facilities. These all cause librarians to better use their professional skills in information, research, and educational services. This results in a better picture of librarians among users. In a dynamic makerspace, librarians can propose new approaches and ideas that make the library a fostering environment for its users and their consequent loyalty. This notion was argued in other studies (Gahagan & Calvert, 2020; Lee, 2017; Filar Williams & Folkman, 2017).

Conclusion

Public libraries should encounter various challenges. As a forum for collecting public members as family members to share their knowledge and information, the public library can provide makerspaces for involving all users. The study revealed that librarians have an undeniable role in this regard, and their positive attitudes and active roles in organizational changes effectively build and develop these spaces. Therefore, effective and skillful human resources should be employed to foster the makerspace in public libraries.

Focusing on the library's physical features and standardized architecture is vital in maintaining user members, absorbing new ones, and creating effective makerspaces. Therefore, library managers should redesign the library building as possible. They must renew existing facilities for future developments, long-term uses, and fulfilling newly-emerged needs. Designing dialogue rooms, cultural-oriented spaces, workshop environments, safety facilities, enough lighting, green spaces, and so on are only some examples. Ergonomic facilities and suitable software and hardware packages for all user groups, including children, work in library makerspaces. Therefore, library managers should take these main factors into account.

We found that new technologies have a significant role in making effective makerspaces in public libraries, increasing users' and librarians' awareness, and providing modern and attractive motivators for more involvement. It is suggested that library managers supply new technologies in libraries in different research and educational domains. These technologies and their better use tend to make active and stable users and participants in public libraries.

The study had two main limitations: participants' less practical knowledge and experiential awareness of makerspaces and their dispersion in different cities in the country and less contact with them due to the COVID-19 pandemic. However, this study highlighted the importance of establishing makerspaces for public libraries countrywide. It manifested the need for further research on other kinds of libraries, even in countries and regions worldwide.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

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