

## Awareness and Use of Library Makerspaces among Library Professionals in India: A Study

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### ABSTRACT

The paper examines the awareness and use of library makerspaces. A well-structured questionnaire was used for collection of data. Around 700 questionnaires were distributed among the Indian library professionals. A total of 500 filled in questionnaires were received, out of which, only 470 questionnaires were selected for analysis of the data. The overall response rate was 67.14 %. The result of the study demonstrates that among all users, 70% male and 30% female are aware of library's makerspaces. Majority of users utilising library makerspaces are pursuing master's degree. It has been found that nearly all of the academic libraries employees are using makerspaces facilities. Maximum number of respondents' (68.09%) using makerspaces facilities for academic and research purposes and reported them as a tool to educate students for the local and global economy (42.55%). When asked respondents about the state-of-the-art tools, technologies or forms for creating makerspaces, 44.68% of respondents claimed that their makerspaces have computer workstations. Approximately, 51.06% respondents indicated that their library's makerspaces offer students workshops/seminars/conferences. Furthermore, the study reflects that maximum number of respondents, i.e., 36% understand the significance of library makerspaces and evaluated them as "valuable".

**Keywords:** Makerspaces, maker movement, libraries, hackerspaces, content creation, fabrication, India.

### 1. INTRODUCTION

Makerspace is 'a physical location embedded to share resources and knowledge, work on, network, projects by different people from different academic background'<sup>1</sup>. It is a hub to create, invent, tinker, explore and discover using a variety of tools and materials to develop certain skills<sup>2</sup>.

It may be pronounced as a community center that provides technology, manufacturing equipment and educational opportunities to the public; things accessible or unaffordable such as 3-D printers, and computer-aided design (CAD) software.

Makerspaces have been defined differently by different people. The goal of makerspaces aims at reducing barriers so that people can learn and start creating their resources and collections. According to Wong, Makerspaces are, "places that help cultivate creative interests, imagination, and passion by allowing participants to draw upon multiple intelligences. They are an effective means of applying knowledge, and they tap new resources for learning. Makerspaces embrace tinkering, or playing, in various forms of exploration, experimentation and engagement, and foster peer interactions as well as the interests of a collective team."<sup>3</sup> They allow free exchange of ideas and resources through exploration, experimentation, engagement and interactions of peer groups.

There are various types of makerspaces offered as municipalities', universities, educational school boards and local communities. The community atmosphere of

the space allows people to learn from each other and experiment rather than receive lessons<sup>4</sup>.

Makerspaces are generally funded by membership fees or through affiliations with external organisations, such as universities, for-profit companies, non-profit organisations and libraries. Initially introduced in 2005 but gained wider acceptance after 2011.

They are of several types including Hackerspaces, Fablabs, Creative space, Techshops etc having their own unique characteristics. A hackerspace is a community-operated workspace where people with common interests, usually in computers, mass production, science, technology, digital or electronic art, can meet, socialise and collaborate. Hackerspaces have also been compared to other community-operated spaces with similar aims and mechanisms such as Fab Lab, started in 2006 by a MIT Professor Neil Gershenfelh, which provides up-to-date designs like electronic appliances, laser cutters, routers, etc., appropriate for makers allowing them to generate anything. Basically it is a platform for learning and innovation. They are likely to be smaller, i.e., 1000-2000 sq ft when compared with other spaces.

TechShops, started in California in 2006 are for-profit and commercial in nature, allow people to access them after paying a monthly fee and focus on community building, delivering large spaces and equipment to attain maximal alliance, cooperation and interchange of ideas and expertise.

Creative spaces are not directly related to any specific tool or set up, sponsored organisation or publication. They embrace any space that renders innovative learning equally devoid of tools/equipment, and allocated space.

This study is an effort to understand the concept and awareness of library makerspaces among professionals in Indian libraries and the way they perceive them. It further explores the benefits accrued from makerspaces, strategies developed for managing them, state-of-the-art facilities offered and finally the satisfaction level of users regarding makerspaces. Response of makerspaces among Indian library professionals shows that bulk of respondents using these facilities are from academic libraries. Makerspaces help professionals to meet the changing demands of users and achieve scholastic endeavours.

## 2. LITERATURE REVIEW

Some recent studies on makerspaces around the world have been penned down chronologically.

Wong & Partridge<sup>5</sup> investigated the experience of Australian universities with makerspaces and found that the adoption of makerspaces in higher education is expected to increase in the next two to three years.

Analysis also unveiled that these makerspaces employ specialist staff, contain 3D printers and laser cutters, and offer facilities to conduct coursework, personal and collaborative projects.

User studies by Coakley & Hurt<sup>6</sup> at the National Institutes of Health and the biomedical research community disclosed that Hundreds of files for 3D-printed lab ware—everything from gel combs and pipette holders to motorised tissue homogenisers and cover slip spinners—can be found online. Desktop 3D printing is expanding beyond the realm of early adopters and hobbyists, and mainstream demand for 3D printers is growing. 3D printing has the potential to play an important role in the laboratory by reducing costs and helping scientists develop and share innovative solutions to technical problems.

Lamprey<sup>7</sup>, *et al.* tried to know how participants in Sub-Saharan African Universities make use of the emerging technologies learnt during the Carnegie CPD programme and evaluated the effectiveness of the training programme on participant's job performance. The study found that the Information Communication Technology (ICT) skills of participants have been evidenced by the application of these skills on their jobs as experienced librarians. However, the demand for ICT and information literacy training by students and faculty has increased due to the exhibit of skills and innovations by CPD. On campus, the makerspace is being embraced by the arts as well as the sciences students and enables peer learning, curiosity, experimental play collaboration, inquiry based, creativity, knowledge networks, trans-literacy, etc with the use of plastics for molding and a 3D Printer for printing the plastic molds.

Noh<sup>8</sup> evaluated the degree of improvement in the participants' creative thinking abilities index after

participants engage in the program for six months in the public library creative zone.

When the overall creative thinking abilities of the participants were analysed, there was a significant difference from the innovative thinking abilities mean score. Finally, there was no difference by gender, but there was a significant difference by grade level for evaluating all creative thinking abilities factors. Barniskis<sup>9</sup> examined the spatial arrangements of two public library makerspaces in USA. The data reveals that exposure is the most critical aspect of the arrangements in these creative spaces. Study also finds that Software solutions, staffing initiatives, and signage are ways to convey the potential uses of the space.

Okpala<sup>10</sup> has highlighted the concept of makerspaces and its apparent benefits in academic libraries in Nigeria. The findings of the study display that users attention is drawing towards library for fostering creativity and invention. Makerspaces offer highly rewarding services to students, faculty members, and staffers and make them learn new things, working with their peers, considering new ideas, exploring, tinkering, and inventing. Training and workshop opportunities for librarians were proposed to make them well equipped with makerspace skills.

Taylor, Hurley & Connolly<sup>11</sup> identified additional roles that makerspaces play: as social spaces, in supporting well being, by serving the needs of the communities they are located in and by reaching out to excluded groups. The authors report on findings from site visits to makerspaces throughout the UK and interviews with makerspace organisers. These roles speak of huge potential for makerspaces to benefit communities and individuals. While not all of the roles authors have observed are present in all makerspaces this is to be expected given how responsive many of the spaces are to the particular needs of their communities—the desire to be more than just a workshop is widespread.

Koh & Abbas<sup>12</sup> investigated the competencies required for the successful performance of professionals in library and museum learning spaces in the U.S. The findings include top competencies (e.g., ability to learn, adapt to new situations, collaborate, serve as an advocate, and serve diverse people) and skills (e.g., management, program development, grant writing, technology, and facilitating learning) required for professionals, as well as relevance of higher education to prepare them for their current positions. The study generated curricular design implications for LIS educators with an emphasis on teaching and learning with technologies.

Burke<sup>13</sup> demonstrated and elaborated the rise of library makerspaces, making activities and technologies in library a makerspaces, profile of academic library makerspaces, and how makerspaces connect to learning in higher education, motivations for creating a makerspace, some considerations when planning a makerspace, and justification for an academic library makerspace. All

libraries, the six significant categories for library makerspace creators were discussing, that is, supporting learning, encouraging collaboration, providing access, expanding library services, following the library's mission, and providing opportunities for individual creation.

Moorefield-Lang<sup>14</sup> analysed the user agreements of makerspaces in public and academic libraries. The study found that the makerspaces are a very exciting topic in the field of library science at present; the application of a maker learning space is still new to many libraries. In this study most user agreements were six months to a year old, and regularities found across makerspace user agreements include accountability waivers, consents for minors, safety, copyright and technology replacement costs.

Dugmore, Lindop & Jacob<sup>15</sup> carried out an analysis of makerspace in Central City library, Auckland Libraries system in New Zealand. Study communicate that the launch of the makerspace has been a challenging but revitalizing project for Auckland Libraries. There has been a growing awareness amongst the community with respect to accessing maker activities. Amongst library staff there is a growth of knowledge and enthusiasm for interacting with the community in this way, building maker culture into our traditional service delivery to create value for customers.

Rich<sup>16</sup> analysed the place of makerspaces in US academic libraries. Democratisation of technology, the maintenance of the library's perception as a leader in technology innovation and the need to support scholarship are the most cited reasons for including a makerspace in an academic library of the libraries surveyed. Respondents also indicated that makerspaces were necessary to keep them abreast with the changing needs of their patrons and to support ongoing scholarship. Slatter & Howard<sup>17</sup> conducted a study on makerspaces at Australian public libraries. The study reveals that higher community commitment, development of a new form of library as 'heart of institution' are the essential benefits of these spaces. Furthermore, the study focused on the budgetary constraints, and confrontation to change within organisations for creating these spaces, and proving the relevance of such spaces within a library setting.

### 3. OBJECTIVES

The aims of the present paper are:

- (a) To highlight the concept of makerspaces and its perceived benefits in Indian libraries
- (b) Find out the awareness and purpose of makerspaces in libraries
- (c) Explore the benefits and usefulness and type of state-of-the-art facilities/equipments available to users in library makerspaces
- (d) Know the services available through library makerspaces and access satisfaction level of users related to makerspaces in library operations.

### 4. METHODOLOGY

The online survey techniques were used for data collection. A survey was projected to collect preferred information about the level of awareness and use of library makerspaces, state-of-the art facilities, and comprehensive support to the users. Random sampling technique has been followed for conducting the study. Overall 700 well-structured questionnaires were distributed among the library professionals in India. A total of 500 filled-in questionnaires were received, out of which, only 470 questionnaires were selected for analysis of the data and 30 questionnaires were rejected due to incomplete responses from the users. The final response rate was 67.14%. The analysis of data collected have been presented with the help of tables, figures, bar-diagram and graphs by using simple statistical techniques, etc. In the light of above data, findings of the study, conclusion and recommendations have been arrived at. The study was conducted during 2-12 November 2016.

### 5. DATA ANALYSIS AND INTERPRETATIONS

The data collected through survey approaches were analysed and inferred and presented here in tables and figures.

#### 5.1 Gender wise Awareness

The sample was collected from library professionals on gender basis to find out their opinion regarding awareness and usage of makerspaces in libraries. The Fig. 1 shows that 70% male and 30% female respondents are aware about the use of makerspaces in libraries.

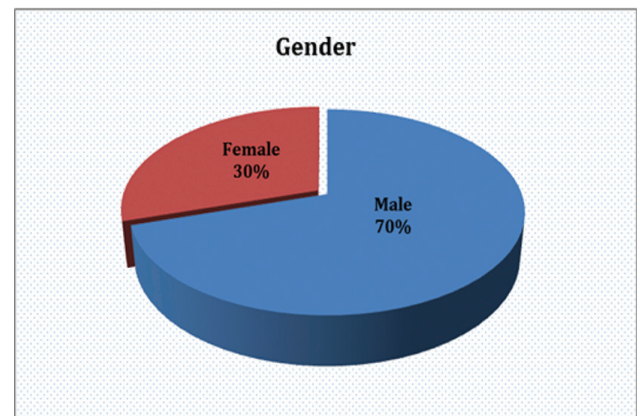


Figure 1. Gender wise awareness.

#### 5.2 Educational Qualification

The sample of the population shows that most of the respondents are pursuing master's degree, i.e., 63.83%, 17.02% respondents have completed PhD in library and information science whereas 17.02% respondents have certificate and diploma, few respondents also having equivalent professional degree in library science (ADIS) from Indian Statistical Institute, Bangalore Centre and NISCAIR, New Delhi. Furthermore, small number of respondents i.e., 2.13% have completed bachelor's degree

(BLISc) (Fig. 2).

Therefore, it is found that majority of makerspaces users (68.3%) are pursuing master’s degree.

**5.3 Professionals Working in Libraries**

Figure 3 presents that enormous number of respondents (73%) are working in academic libraries, while 19% of them are working in special libraries including engineering colleges, medical colleges and R&D institutions. A little percentage (4%) of respondents belongs to national library whereas a minor percentage (2%) is from public and others libraries like community libraries.

So, it can be noticed that bulk of respondents, i.e., 73% using makerspace facilities are from academic libraries.

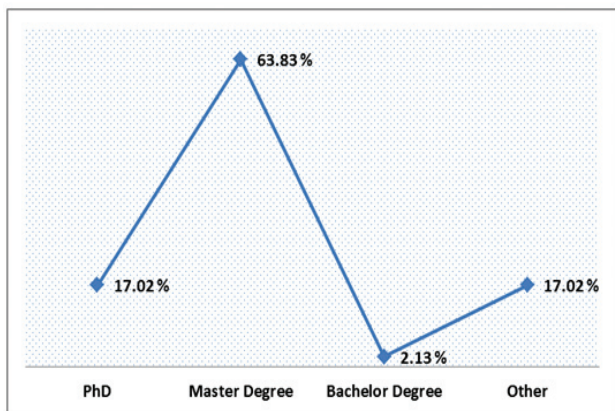


Figure 2. Educational qualification.

**5.4 Commencement of Makerspaces in Libraries**

Makerspaces tend to be of recent origin to most of the libraries. Response regarding inception of makerspaces in libraries has been provided in Table 1. Data reveals that 19.15% respondents indicated that makerspaces in their library introduced in 2016. 17.02% respondents evidenced that their library makerspaces initiated in 2011. 12.77% respondents indicated their library makerspace launched in 2015, whereas 10.64% respondents opined they were introduced to makerspaces in 2009 and 2012 each.

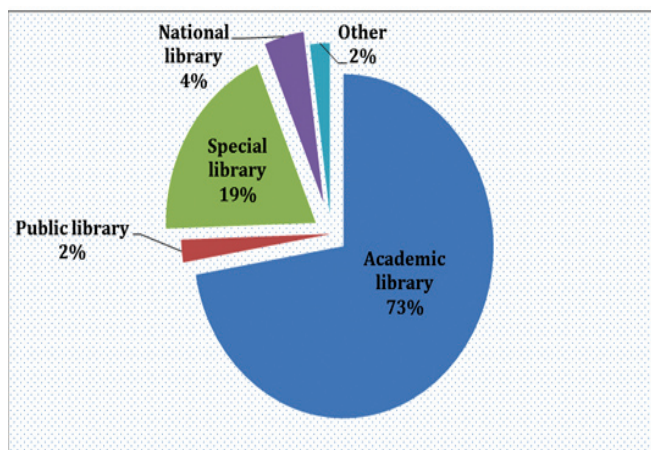


Figure 3. Types of libraries.

Similarly 8.51% respondents each said library makerspaces commenced during 2010 and 2013, whereas, remaining 6.38% respondents each conveyed that makerspaces opened in their libraries during the years 2008 and 2014 (Table 1).

It is established that a good number of respondents (19.15%) affirmed that their library makerspaces opened last year, in 2016.

Table 1. Commencement of makerspaces in libraries

S. No.	Year	Response (n=470)	Percentage
1.	2008	30	6.38%
2.	2009	50	10.64%
3.	2010	40	8.51%
4.	2011	80	17.02%
5.	2012	50	10.64%
6.	2013	40	8.51%
7.	2014	30	6.38%
8.	2015	60	12.77%
9.	2016	90	19.15%
<b>Total</b>		<b>470</b>	<b>100</b>

**5.5 Purpose of Makerspaces**

The Fig. 4 indicates that maximum percentage of respondents’ (68.09%) using makerspaces for academic and research purposes while 40.43% respondents are making use of them for reference and information services. This study further reveals that 31.91% of the respondents use makerspaces as professionals. Another 25.53% respondents reasoned that library makerspaces are helpful for them in acquiring knowledge, 14.89% visualised them for recreational purpose while 8.51% of the respondents admitted that their objective of using makerspaces is to get inspiration. Only a small percentage, i.e., 2.13% of respondents cited that they use makerspaces for others purposes.

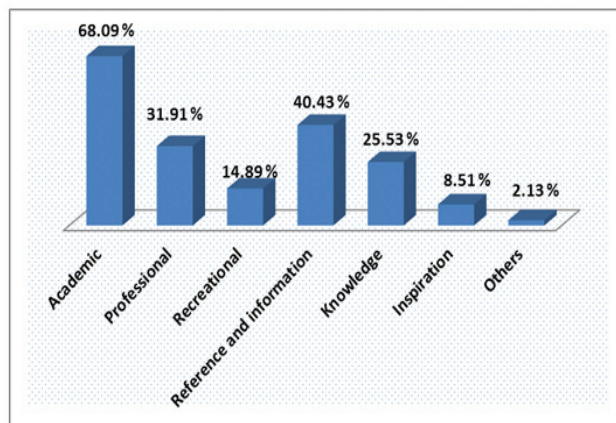


Figure 4. Purpose of makerspaces.

### 5.6 Opinion about Makerspaces

Respondents' perspective about usefulness of makerspaces in libraries has been exhibited in Fig. 5. It was explored that the majority of respondents (42.55%) reported makerspaces as a tool for educating students for the local and global economy, while 31.91% respondents remarked them as serving a growing and diverse population. Further 25.53% respondents described makerspaces as a mode of building and maintaining state-of-the-art technology, whereas 17.02% respondents appraised them as building and maintaining state-of-the-art facilities. Only 2.13% respondents indicated that makerspaces serve other facilities in libraries.

### 5.7 State-of-the Art Facilities in Makerspaces

When asked respondents about the tools, technologies or forms, i.e., state-of-the art facilities available in library's makerspaces, 44.68% respondents claimed that their makerspace has a computer workstation, while 42.55% of them indicated computer programming/software

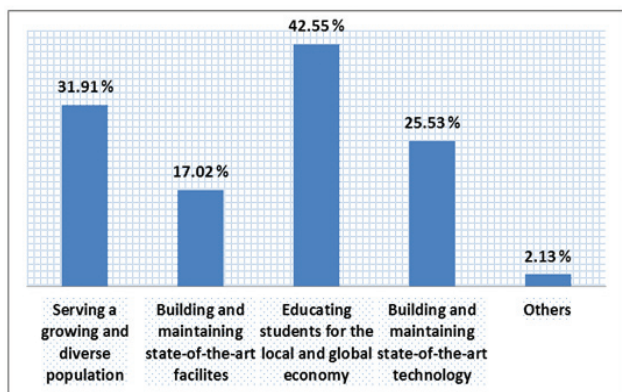


Figure 5. Opinion about makerspaces.

Table 2: State-of-the art facilities in makerspaces

S. No.	Library's Makerspaces	Response (n=470)	Percentage
1.	Computer workstations	210	44.68
2.	3D Printer	20	4.26
3.	3D Scanner	60	12.77
4.	Photo editing	80	17.02
5.	Computer programming/software	200	42.55
6.	Arts and crafts	40	8.51
7.	Crating website or online portfolio	80	17.02
8.	Digital music recording	10	2.13
9.	3D Modelling	10	2.13
10.	Laser cutter	10	2.13
11.	Animation	10	2.13
12.	Scanning photos to digital	130	27.66
13.	Tinkering	10	2.13
14.	Others	20	4.26

(Table 2). Approximately 27.66% respondents' admitted that their makerspaces have options of scanning photos to digital, while 17.02% of respondents affirm photo-editing and creating websites or online portfolio were found in surveyed makerspaces. Furthermore, 12.77% of respondents shown that they have included instruction on 3D Scanner. A small number of people preferred instruction on arts and crafts (8.51%), Very few, i.e., 4.26% each favoured 3D printing and other state-of-the-art facilities, whereas 3D modeling, laser cutter, animation, and tinkering technologies were embraced with a percentage of 2.13% each.

As demonstrated from the interpretation, a good percentage of respondents, i.e., 44.68 % remarked that their makerspaces have computer workstations equipped with state-of-the-art technologies.

### 5.8 Services Offered Through Makerspaces

As far as services offered through makerspaces have been concerned, 51.06% respondents indicated that their library's makerspaces offer students workshops/ seminars/ conferences whereas 46.81% respondents acknowledged that makerspaces provide book exhibition on the date of birth of great personalities. Additionally 44.68% respondents shared that makerspaces furnish orientation programs while 31.91% respondents are of the view that makerspaces support online tutorials/training. Another respondents provided a similar response with 31.91% for "personal appointments for training." Regarding the course for credit called as "Makerbots and Mashup", 17.02% respondents stated that they introduced all tools to the students through a series of guided lessons and projects culminating in a final project that incorporates several different tools. Moreover, course for no credit seems to be less popular among academic library makerspaces users and accounted to 10.64% (Fig. 6).

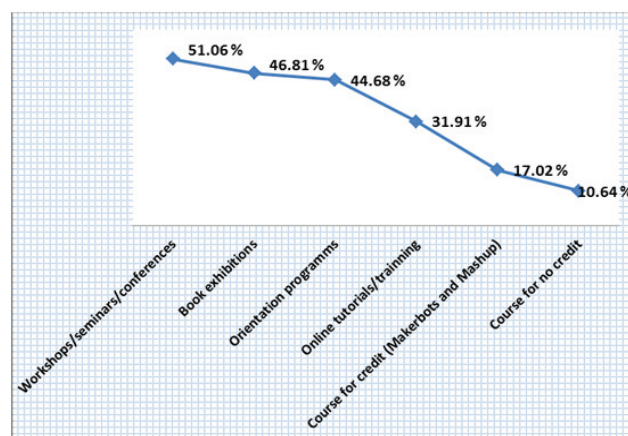
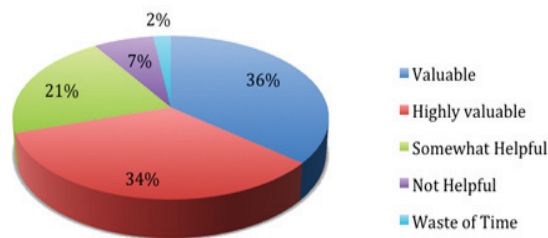


Figure 6. Services offered through makerspaces.

### 5.9 Satisfaction Regarding Library Makerspaces

An attempt was made to know the satisfaction level of respondents regarding library makerspaces facilities available and the response furnished is demonstrated in Fig. 7. Analysis reports that the largest number of respondents, i.e., 36% considered library makerspaces



**Figure 7. Satisfaction regarding library makerspaces.**

as beneficial for user awareness and rated them as “valuable”, while 34% of respondents assessed as “highly valuable”. Furthermore 21% of respondents analysed them as “Somewhat helpful”. The minimum number of respondents, i.e., 7% adjudged makerspaces, as “not helpful” while tiny percentage, i.e., only 2% acknowledged them as “waste of time”.

The statistics reflects that maximum number of respondents, i.e., 36% understand the significance of library makerspaces and evaluated them as “valuable”.

## 6. FINDING OF THE STUDY

The major findings of the study are as under:

- Male users (70%) are more aware than female users (30%) about usage of makerspaces in libraries
- It is noticed that majority of users (68.3%) using makerspaces in libraries are pursuing master’s degree
- Most of the academic libraries employees (73%) are utilising makerspaces facilities
- 90% of respondents indicated that their library makerspaces launched recently in 2016
- Maximum percentage (68.09%) of respondents are using makerspaces for academic and research purpose
- Majority of respondents’ (42.55%) submitted makerspaces as a tool to educate students for the local and global economy
- An acceptable percentage of respondents, i.e. 44.68% cited that their library makerspaces are equipped with computer workstations state-of-the-art technologies
- Maximum number of users, i.e., 51.06% indicated that library’s makerspaces invite student’s workshops/seminars/conferences
- The study established that mostly respondents, i.e., 36% evaluated library’s makerspaces valuable.

## 7. CONCLUSIONS AND RECOMMENDATIONS

Libraries of today are not just a place to sit quietly and consult books and other pedagogical materials but they have completely transformed into a spot where users can interact, create and collaborate. Makerspaces are the demand of modern libraries and expected to be a growing trend in the years to come. The idea of establishing

makerspace in the library fosters creativity and invention. The study found that maximum respondents, i.e., 68.09% use makerspace for scholastic/instructional purpose. The study also found that almost all respondents’ appraised library’s makerspaces beneficial.

Makerspaces are a new concept in Indian Libraries. There is a dire need to make models of successful makerspaces. Continuous training programs are key component of creating successful and inclusive makerspaces. The staff and users of makerspaces are presumed to work together for creating a safe and conducive environment. There is a pressing need of makerspaces in the Indian libraries to introduce new technologies and boost the library’s image. It requires a massive effort both from librarians and users and they are expected to be vigilant enough, have a curious mind and should be passionate about learning and embracing new technologies and ideas. The maker movement is gaining momentum and has a long way to go but its widespread awareness and usage will make this initiative a successful platform.

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