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Article

Application of Graphical Analysis Techniques to Evaluate the Usefulness of School Library Services During COVID-19 Pandemic

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A B S T R A C T

Graphical analysis is a powerful method to analyse data in a quick matter and present in an appealing visualize manner. It includes various techniques and can be done through different tools such as Excel, SPSS, R, Python and MATLAB. To work with techniques practically, a study on the services of select school libraries will be conducted. School Libraries play an essential role in providing resources for the intellectual development of the students. Other than the classroom, the library provides a space for the students for affirming the teaching and learning process. Resources, references and space are the three essential services that the library offers. COVID-19 pandemic has brought in an unprecedented situation and forced the physical closure of the academic institutions. Somehow libraries have found ways and means to deliver their services in the virtual mode thereby benefiting its users in teaching and learning process. These may include virtual reference services, e-document delivery services, organising virtual literacy events, etc. The evaluation of the usefulness of the services delivered virtually is required by the libraries to identify their success rate. The study is based on the objective to apply techniques of graphical analysis to evaluate the usefulness of the school library services delivered during the pandemic. The study will use survey methodology to collect the data from school students of different age groups and restricted to four schools from Odisha. The checklist, rating scale, opinionnaire, questionnaire and interview method will be used to collect data. The collected data will be presented in the graphical format. They will be analysed using one-way displays of one-way data, two-way displays of one-way data, two-way data, multivariate data techniques which will include time series, plots, charts and histograms. The study will depict the various techniques in graphical analysis and show their implementation using collected data. Additionally, the study will reflect the outcome of the evaluation of role of library services during COVID-19 pandemic.

Keywords: Graphical Analysis Techniques, Survey Methodology, Check List, Rating Scale, Opinionnaire, Questionnaire

Introduction

Across the world, the Corona virus pandemic (COVID-19) shut down schools and forced parents to take charge of their children's schooling which could enhance existing inequalities in children's learning opportunities due to the ability to provide effective home schooling, resources available (Jæger and Blaabæk, 2020). This virus is highly contagious and forced people to change their lifestyle. This unprecedented situation leads to a change in the system of teaching and learning process also (Ishtiaq, Sehar and Shahid, 2020). The regular education changed to distance education while classroom learning changed to self-learning. And this possible with the help of advance technology and modern tools. To cope up with this situation, school libraries and librarians played an important role along with other institutions. The challenge for school librarians was to support the school curriculum, maintain a continued interest in reading (Suraweera, et al.,2020). As usual the challenge is whether the school librarians possess the competencies to adopt technology with proper training, as they play a main link between digital resources and users in times of crisis. (Kumbar and Pattanshetti, 2013).

Many school libraries stopped providing services to their users due to lack infrastructure and funds, while many libraries continued to provide their services online to their users to cope up with the mission of their parent organisations. Students are the major stakeholders of the school library. Though all the students have no equal access to resources to adopt with the changing technology it is important to study the usefulness of the school libraries from students' perspective. To evaluate the usefulness of the school library services, the graphical analysis techniques were applied to the collected data. It was found out that Government school libraries were somehow unable to provide the required information in comparison to Private school libraries.

Background Study

Schools work on a primary mission to educate children to prepare them to become responsible and productive members of society and school also supports students in academic as well in non-academic arenas like health and skill (Hoffman and Miller, 2020). The term school library is a school's physical and digital learning space where reading, inquiry, research, thinking, imagination and creativity are central to students' information-to-knowledge journey and to their personal, social and cultural growth. It may be digital or physical space (IFLA, 2015). Resources, references, and space are the three essential services that the library offers. IFLA (2015) explained that a school library with strong networked information technology infrastructure provides access to collections, community resources, and curated digital collections. It also provides tools for undertaking research-based inquiry and the construction, presentation and sharing of knowledge. Suraweera, et al., (2020) stated that libraries performed under constantly changing environment due to COVID-19 pandemic where they need to keep their focus on the children's need and provided current services and developed new services to fulfil those needs. These new services may include virtual reference services, e-document delivery services, organising virtual literacy events, etc. "To deal with the rapidly changing outbreak or epidemic disaster libraries, librarian responds to rapidly evolving information and guidelines, for acquiring, processing, interpreting, repackaging and disseminating relevant, up-to-date users and should always be ready and enhance its capabilities and move away from traditional way and to adopt virtual ways" (Ishtiaq, Sehar and Shahid, 2020).

To understand the usefulness of these new services or any other services adopted by the school libraries, evaluation is an important element. IFLA (2015) described that evaluation of school library services is an essential aspect of school library development. This serves accountability purposes and helps to determine if the school library services and programs are meeting the needs of the school community. IFLA (2015) also stated that evaluation influence the stakeholders and contribute to the ongoing transformation of school library services. Selecting an evaluation method or approach will depend on the needs of the school community and the developmental stage of the library. Though it is an unprecedented situation, it is important to analyse challenges related to emergency remote teaching and role of libraries and librarians and their impact on the students (Ferri, Grifoni and Guzzo, 2020).

Graphical analysis is a powerful method to analyse data in a quick matter and present in an appealing visualize manner. It includes various techniques and can be done through different tools such as Excel, SPSS, R, Python and MATLAB.

There is no better way to express data in a pictorial form as it is worth a thousand words, numbers, there is no better way of getting a 'feel' for the data (Public Health Action Support Team (PHAST), 2020). Lewi (2006) defined Graphics as translations of numbers in the form of a drawing, design, or plan to explain or illustrate something. Moses (2020) illustrated that the graphical presentation of statistical data is a relatively recent development, and it depends upon two aspects such as: (a) the data and representing them graphically, (b) the intended reader's ease of correctly understanding the resulting graph.

"COVID-19 provides a unique opportunity for academic librarians to rethink their key roles and core values in supporting teaching and learning of their institutions during this very challenging time" (Leo, 2020). Looking into the above observations by various experts and professionals, an effort is made to undertake the present study.

Statement of Problem

It is a fact that all the schools do not have well-established libraries equipped with latest technologies and tools. And when it comes to the rural area, the chances of these services are rare. In the same way the school children may or may not have the skills to adopt the modern technology and tools like smart phones and laptops. Surfing through internet to find information is not an easy task for all. In this context, school libraries play an important role. As we know the COVID-19 pandemic has forced everyone to stay at home, so the home schooling is continuing. In this crisis majority t of school libraries provided many services. But the question here arises as to what kind of services t were provided during this pandemic? whether these services reached to all the students? Whether all the students got benefited from the library? Whether the services provided by the library are enough to fulfil the information requirement for their curricular and co-curricular activities? Last but not the least, Whether the students were satisfied with the services?

Keeping all these question in mind, the objectives and methodology were Framed:

Objectives

The main objective of the study is to apply techniques of graphical analysis to evaluate the usefulness of the school library services delivered during the pandemic period. Besides these other objectives of the study are:

- To compare the services provided by the school libraries before the pandemic and during the pandemic
- To evaluate the usefulness of these services to the students
- To understand the different graphical methods which are useful in LIS field
- To understand the application of these techniques

Scope and Limitation

The study be will be helpful to find out the services provided by the libraries selected. The study will focus on benefits that the students get due to these services.

Due to COVID-19 restriction the study was conducted in a limited area with a small sample size. The study will be covered only four schools of two localities that is urban area and rural area namely Bhubaneswar and Anandapur two localities of Odisha State.

Methodology

The study was conducted using the following methodology to achieve the mentioned objectives. Firstly, an elaborative literature Review was conducted, samples with geographical scope in consideration were selected for data collection. Four school of different categories namely Private Urban CBSE School, Private rural CBSE School, Government Urban Odia (Odisha State Board) School, Government Rural Odia (Odisha State Board) School were taken up for the study.

Secondly, survey methodology with questionnaire tool was adopted to collect data. Questionnaire contained twenty questions among which eight were general and twelve questions were specific questions related to library services provided during pandemic period. Questionnaire was made using google form and was mailed to the respondents. Interview was also conducted for the same set of questions to collect data from some students who did not have smart gadgets. Snowball technique was applied to select samples, and Initially the questionnaires were sent to only 4 recipients of each school and these recipients shared it with other respondents.

Finally, the collected data was presented in various graphs according to the nature of data.

Graphical Method

Graphs provide quick, visual summaries of essential data characteristics and a powerful evaluation tool. It helps to represent complex statistical equations in a few simple plots. Generally graphical method deals with quantitative data. It is a key component of Exploratory Data Analysis (EDA). These graphs provide information about concentration ranges, shapes of distributions, extreme values (outliers), relationships between different data sets, trends (Interstate Technical and Regulatory Council (ITRC), 2013).

"William Playfair is usually credited with inventing the area charts as well as the line, bar and pie charts" (Wikipedia, 2021). Wainer (2003) stated that in 1786 Play fair's Political Atlas with spatial dimensions published and brought a major conceptual breakthrough in graphical presentation.

Graphical methods are defined by model schemes, to analyse and improve existing solutions. These include process mapping methods, Ishikawa diagrams and Gantt schedules and graphs. Process mapping is one of the most used graphical methods (Romanowski and Nadolny, 2018).

Wainer (2003) gave a divisional structure of graphical techniques. They are as follows:

- One-Way Displays of One- Way Data
- Two-Way Displays of One-Way Data
- Two-Way Displays of (Mostly) Two-Way Data
- Two-Way Displays of Multivariate Data
- Three-and-More-Way Displays of Multivariate Data

Wikipedia (2020) gave a list of different graphical techniques and divided those according to their use. Some of these techniques will be applied in this study to evaluate.

Simple Displays

- Area chart

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- Histogram
- Bar chart
- Line chart
- Pie chart
- Scatterplot
- Tree Map
- Box and Whisker chart
- Waterfall chart
- Stacked bar

Data Analysis

The collected data represented in various graphs is analysed in this section:

Area Chart: Area chart helps to describe quantitative data related to an area or a location.

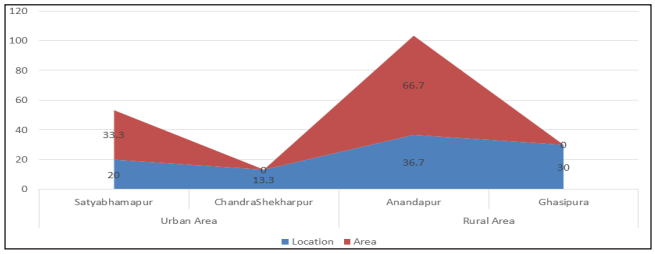

Figure 1.Area Chart

Figure 1, displays that 33.3% of sample received was from urban areas whereas 66.7% of sample received was from the rural areas. The ratio between the samples received from urban area and Rural area is 1:2. The Figure also depicts that from Anandapur highest number of responses was received and that is 36.7% of the total population whereas from Chandrasekharpur, the lowest number of responses was received, it was 13.3% of the total population.

Pie Chart: A pie chart is a circular statistical graph. This is divided into several parts according to the data and demonstrate the quantitative value for each piece of data. Wikipedia (2020) stated that pie chart is not a preferable method for data illustration. There are several types of pie charts such as Doughnut chart, Exploded pie chart, Polar area diagram.

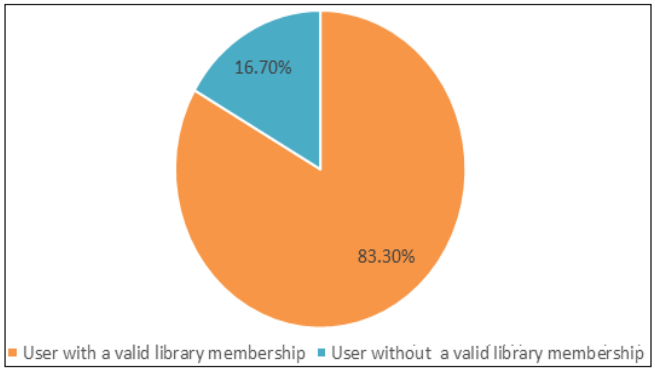

Figure 2.Pie Chart

Here the pie chart (Figure 2) is divided into two parts. Yellow coloured section represents the value of percentage of users with a valid membership id and blue coloured section represents the percentage of users who do not have valid membership id. This pie chart depicts that nearly 83.30% students have their valid library membership Id while 16.70% do not have their membership Id.

Histogram: Histogram represents the data in a several non-overlapping blocks with equal interval (PHAST, 2020).

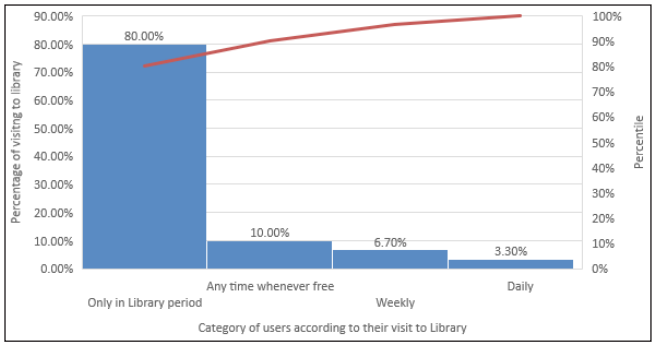

Figure 3.Histogram

There are four separate columns in Figure 3 that represents that 80% students use the library only during library period while 10% students said that they visit library whenever they are free. 6.70% of the students and 3.30% of the students visit the library weekly and daily respectively. The histogram also represents that it took 80% as 100 percentiles to make it easy for the calculation and according to that all the values were set.

Table 1

S. No.	Services	Percentage of student agreeing with the provision of the services
1.	Reading space	86.70%
2.	Issue/return of books	90%
3.	Provides makerspace	70%
4.	Literacy activities	56%
5.	Support your hobbies and subject interests	70%
6.	Assists you to find books or materials you need	53.30%
7.	Assists in curricular and co-curricular activities	40%
8	Supports in extracurricular	33.30%
9	Organises book fair	13.30%
10	Provides orientation	6.70%
11	Other	0%

Scatter Plot: Scatter plot is useful to show the relationship between continuous variables. Mostly it is used to show two variables which are constantly changing. It is useful because it retains the exact values of data.

The Table here shows different services provided by a school library. In a close ended questionnaire with checkboxes the respondents gave their view with above mentioned percentage. The same table is presented using scatter plot for better visualization.

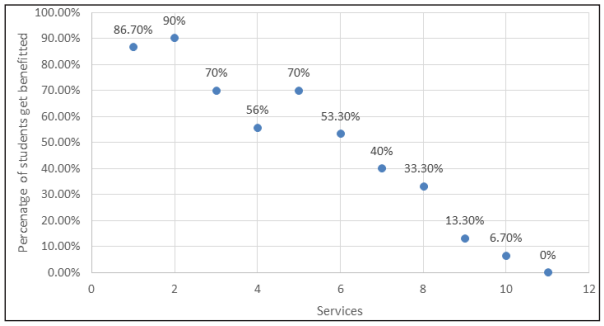

Figure 4.Scatter Plots

Responding to the question regarding services provided by their libraries before COVID-19 Pandemic, 86.70% of total respondents said that their libraries provide the reading space while 90% of the respondents agreed that their school libraries were allowing them to issue and return the books from the libraries. In the same way only 13.30% and 6.70% of respondents said that their libraries organise book fairs and provide orientation programs, respectively.

Bar Chart: Bar chart is one of the most used graphical method. It is used to compare the value of multiple variables in a single chart (Sonnad, 2002). It is used to represent categorical data in a single chart (PHAST, 2020).

Figure 5, shows that nearly 96.70% respondents used internet to find required information and coming to next 63.30% respondents said they took help of their teachers and read books to fulfil their information needs. While looking at the usefulness of the library in COVID-19 situation, only 10% of the total respondents said that they took help of library by visiting physically or by telephonic mode.

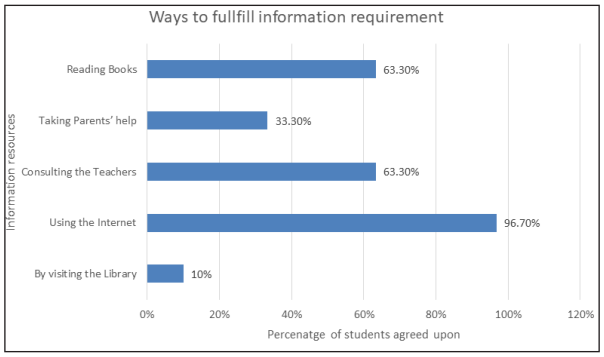

Figure 5.Bar Chart

Waterfall Chart: A waterfall chart helps in understanding the positive or negative values that occur sequentially. These values can be category based and time based. One can use waterfall chart for analysis of various quantitative data (Wikipedia, 2020). Giving services during times of crisis always adds positive value to the community. In this regard waterfall chart can be used to express value.

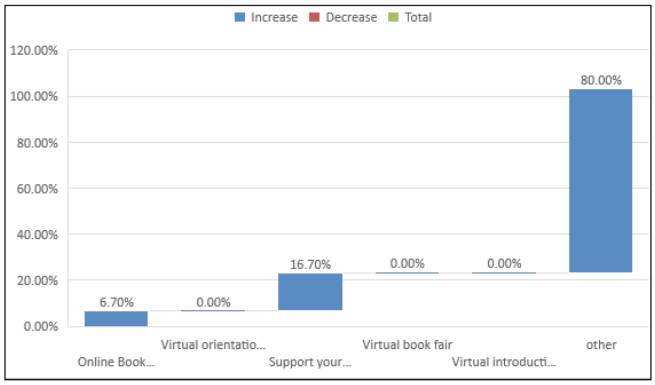

Figure 6.Waterfall Chart

Figure 6, represents that 6.70% students agreed that their library provides online book delivery services to them and 16.70% students said that their library supports them to fulfil their information requirement for assignments and projects. 80% respondents said that their library did not provide any services during COVID-19 pandemic. None of the selected libraries provided virtual orientation programme, virtual book fair or virtual introduction to OERs during the pandemic period.

Stacked Bar: Stacked bar is used when there is a necessity of relative decomposition of each primary bar based on the levels of a second categorical variable. Each bar consists of several sub bars and each stacked bar is the same as before (Chartio, 2020). Here the stacked bar has two sub bars one for yes and other for no which depicts the communication between library and student, vice versa as a whole.

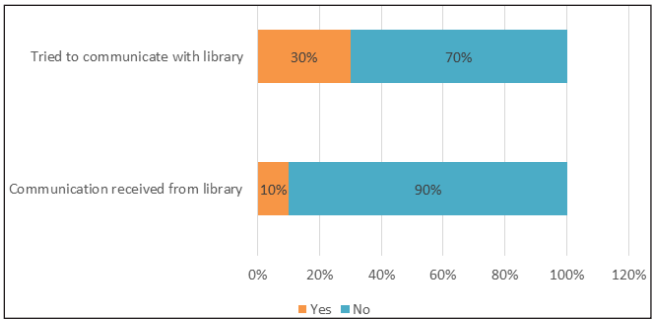

Figure 7.Stacked Bar

Figure 7, shows that 30% of respondents tried to communicate with library during the school closure because of pandemic to fulfil their information needs but on the other hand only 10% respondents received communication from the library.

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Radar Chart: Radar chart is also called as spider chart. It represents multivariate data in the form of a two-dimensional chart of three or more quantitative variables represented on axes starting from the same point (Wikipedia, 2020, FusionCharts, 2021). The color codes help to identify each node that indicates the quantitative value.

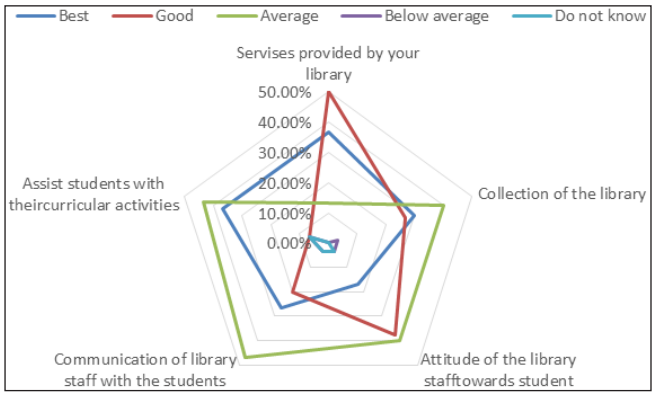

Figure 8.Radar Chart

Figure 8, depicts that 36.70 % respondents opined that the services provided by their library is the best while the same respondents said in assisting students with their curricular activities their library is best. Only 26.70% respondents responded with the best rating for the communication of library staff with them. Only 30.00% and 16.70% of respondents said that they were happy with their library collection and library staff's attitude, respectively. It also depicts that in four cases, students gave average rating to their library whereas only in one case that is services provided by their library were rated with Good option. Respondents who gave below average ratings was very minimum.

Findings

The study was conducted to find the usefulness of information services of the school libraries during COVID-19 pandemic. In this regarding several questions were asked through the questionnaire and data received was analysed.

First two questions were asked to students to know whether their school has a library or not and whether they had to carry a valid library card. In response to these questions 100% of respondents said yes, their schools had libraries. But only 50% respondents said that they have valid library card. It was noticed that these 50% respondents belong to CBSE Schools of both Urban and Rural areas.

Third question was asked as to how frequently they visited the library before COVID-19 pandemic, to know the potential of students. It was observed that most of the students nearly 80% visited library only in the allotted library period. These 80% students belong to all category of students. But it is important to note that 13.3% of respondents who visits library either daily or any time whenever free belonged to CBSE Schools of both rural and urban areas. On the other side, 6.7% respondents who visited library weekly belonged to CBSE schools of both the areas.

For the question of what kind of services were provided by their libraries before COVID-19, more than 50% of students of all category agreed that their library provided reading space, makerspace, issue/ return of books and assist them in finding books, conduct literacy activities and help them with their hobbies and interest. Only 6.7% respondents said that their library provides orientation.

In the next two questions, it was asked as to how they fulfilled their information needs during the lock down and whether their library put up a list of OERs in the school website. In response to these two questions, 96.7% of respondents answered that they used internet to find information while 90% of the respondent did not visit library physically or virtually to fulfil their information need. 63.7% respondents depend upon syllabus and books to fulfil the need. Surprisingly While 96.7% respondents used internet, most of them do not know about OERs. Neither their library put any list of OERs on the library website. It was important to point out that both the Odia (Odisha State Board) school libraries do not have their own school websites, while the CBSE schools only provide a static page giving brief information about their library.

On the questions regarding their preferred search mode on internet and how many books they had read for their assignments, nearly 70% respondents replied with the answer that they do not know while 30% respondents said they had used two to three books to complete their assignments and their preferred search mode is searching for pdf formats and watching video tutorial.

Next two questions were asked to know the interaction between library staff and students during the lock down. The responses received stated that only 30% respondents of all category tried to get in touch with library for their information needs but only 10% respondents belonged to CBSE board of both urban and rural areas who received communication from their libraries.

For the question regarding what the services were provided by their library during the COVID-19 Pandemic, 80% of respondents said that their library did not provide any service during the lockdown and only 16% said that their library helped them in fulfilling the information requirement for assignments and projects and only 6.7% of respondents said that their library provided online book delivery service during the lock down. It was also noticed that none of the libraries organise virtual book fairs or introduced OERs and or conducted Virtual orientation program. Though space was provided for students to respond under the others option (library services), none of the respondents filled it

with addition information which reflects that those libraries did not organise any engagement activity for their students.

Lastly when it was asked to give rating to their library services and staff, in four cases highest number of students rated them as average, while only in service provided by the library was rated as good. It is an important thing that more than 50% students are happy with the collection of their libraries.

Discussion

After the analysis of the data was done and findings were noted down it can be stated that all the services provided by the library do not reach out to all the students, as there was variation noticed in received data. A larger sample size may solve this issue. All families do not have similar financial status and environmental condition. So, all the students may not have similar resources and have same attitude. All these condition leads to learning inequalities. It was also noticed that many students prefer internet over the library and the range of differences were noticed (nearly 86%) which is huge. The status of interacting between library staff and students was not reflecting well. Library professionals should develop personal competencies and professional competencies to solve all these issues. Professional competencies relate to the knowledge of information resources (OERs), information access (information retrieving techniques), technology (Integrated library management system, Computer, E-resource etc.), management (Change management, Human resource management and resource management) and research (Use and User study). Personal competencies relate to the knowledge of skills (Communication, Interaction and interpretation), attitudes (Behaviour and response) and values (Lifelong reading, morals and positive vibes) (Kumbar and Pattanshetti, 2013).

By willing to accept trends and experimenting, a researcher can use many other graphical techniques for data analysis. For conceptual presentation in case of user study and use study, mind maps can be used. Conducting a project work like moving of library or data migration can be easy planned with the help of PERT, CPM and Gantt Chart. Researchers can use geo charts to represent any data that is related to the geographical area. Besides these box plots, box-whiskers, venn diagrams and flow charts can be used for data analysis in LIS field (Wikipedia, 2020). Researcher can also find many more graphical methods and can attempt to convert the collected data into graphs using different software. SPSS, R, MATLAB and Python are some popular software which helps researchers in analysing the data and presenting it in a graphical manner.

Conclusion

The study helps to conclude that the selected school libraries did not explore the opportunities to provide library services in an innovative way. Unavailability of required resources and lack of technical skills acted as obstacles to reach out to the students. One of the major factors adding to the helpless situation is lack of appropriate infrastructure. All most four of these school libraries followed traditional methods to disseminate information, so in the pandemic period they were helpless. It is time to rethink and recheck and reshape the library to meet future needs and tackle any unprecedented situation like COVID-19 in the future. School librarians should go for online options, at least in the field of communicating with users, dealing with their needs by providing them virtual reference service, e-document delivery service to fulfil the information needs (Ishtiaq, Sehar and Shahid, 2020).

In this paper several graphic methods were introduced and their implications in the field of LIS were also described. Graphical methods are useful, right from data analysis to data presentation. There are several methods and techniques available for converting of data into readable graphs. Graphs are mostly used for quantitative data. Sometime qualitative data can also be graphed using mind maps, word clouds, etc. Now a days there are many other methods for data representation are available but in contrast, graphical methods for categorical data are still in infancy (Friendly, 1992). All that is needed is genuine interest and innovative spirit among the school librarians to adopt new tools and technologies.

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