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Preparedness of the Libraries to Address the Recent Pandemic: A Case Study on 100 Top Academic Institutes of India

Anupta Jana* and Rosalien Rout

School of Library and Information Science, Gangadhar Meher University, Sambalpur - 768 001, India
**Email: anuptajana@gmail.com*

ABSTRACT

In an academic set up the 'library' plays a pivotal role. It stores, analyses, interpret and disseminate information among the users to fulfil their information needs. It has been observed that recent technological advancement has revolutionised library services to a great extent. Now libraries are providing both physical as well as web-enabled library services to their users. In this context, library websites act as a major gateway in providing web-enabled library services. The sudden outbreak of the COVID-19 pandemic has disrupted the physical mode of library services. However, to support the ongoing teaching and learning process, libraries need to continue their services despite the lockdown. Therefore, the present study seeks to find out whether academic libraries are ready and adequately equipped to perform basic services during this critical juncture. The present study was directed towards exploring the readiness among the academic libraries by assessing their websites based on selected evaluation criteria. Hence, in this study top, 100 NIRF ranked institutes websites were examined by adopting 30-point evaluation criteria. These criteria were selected from the extant literature. These criteria were grouped into 04 categories i.e., basic website information, resource discovery, availability of resources and reference services. The readiness index of each library was calculated based on the availability and non-availability of the said criteria. The findings of the study reveal that 64 per cent of the libraries have failed to secure their score of 50 per cent on predefined criteria. It was also found that the preparedness index is independent of NIRF ranking. Overall findings of the study make it clear that academic libraries need to improve and up to date their web-based services to play a proactive role in the present and post-pandemic situation.

Keywords: Academic library; Library websites; Library services; COVID -19 pandemic; Preparedness index

1. INTRODUCTION

In India 'Lockdown' was declared during the last week of March 2020, consequently, all educational institutions and libraries were closed. The outbreak of the COVID-19 pandemic has changed every aspect of human life to great extent. It changed the common teaching-learning pattern and practices. UNESCO[1], 2020 report reveals that most of the academic activities like teaching, learning, conducting examinations, doing research works, providing library services, were interrupted which severely affected 320 million students of the country. Therefore, higher educational institutions were started organising e-learning platform for their students. In support of e-learning, libraries also needed to continue offering different innovative web-based services. Hinchliffe & Wolff-Eisenberg[2] mentioned that to overcome this situation libraries also accelerate web-based services to promote e-learning. The survey report of the ALA[3] mentioned that libraries are now to continue to expand the accessibility of digital resources and launch different virtual programs to cope with the prevailing situation. To manage the pandemic situation libraries should promote different services like online article request service, online renewals, issuing virtual library cards, e-mailing barcodes numbers for smooth accessibility, borrowing e-books, online delivery, etc. among users. IFLA[4] also identified different remotely accessible library services such as the provision of free e-books, freely available different resources, Open Access (OA) materials on COVID-19, virtual exhibitions, media and information literacy, Ask-a-Librarian, online article request service, consultation service through video conference which were accessible through a single-window interface. Massachusetts Library System[5] sought to promote their services on the internet during the pandemic, where weightage was given in bridging the digital divide, ensuring access to e-books, databases, e-resources, offering virtual programs, promoting self-care, and staying connected with users' community through social media group. But it seems that Indian academic libraries were not completely prepared to face the situation.

However, the conventional set up of academic libraries has undergone a tremendous change. Nowadays libraries are prioritizing digital resources and services. They are procuring more and more electronic resources like electronic-journals, electronic-book online databases as well as locally digitised these and dissertations. They are increasingly giving impotence to web-based services. Library websites have become a major

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means of providing electronic-based services. Hence, the e-services quality of the libraries can be assessed through their website. Therefore, the study is an attempt to examine the preparedness of Indian academic libraries to face the challenges prevailing in the country due to pandemic by evaluating their library websites.

2. LITERATURE REVIEW

There were a few works of literature on library services provided during COVID-19. Winata, Fadelina and Basuki[6] highlight the issue relating to the adaptiveness of different web-based services instead of physical services. The study found that almost all universities libraries had transformed from physical to virtual to provide library services. Evaluating the usefulness of e-services of libraries is important. Library websites are considered the main getaway of e-services provided by the libraries. The literature on website evaluation is going day by day. In this context, Kaushik[7] studied 28 National Institutes of Technology (NITs) library websites and reported that most of the library websites are unable to maintain effective search interface, web 2.0 tools, cloud-based services, etc. and the study suggested that the websites need to be improved. Madhusudan & Ahmed[8] conducted a study to evaluate the audio-visual contents and user-friendliness of the Indian Institutes of Management (IIMs) library websites. A checklist of 11 features was formulated to evaluate the websites. The study revealed that the websites were still lagging to facilitate audio-visual contents, web 2.0 tools, guidance tools etc. Shukla & Tripathi[9] assessed the contents of the library websites of Indian academic institutes. To do this evaluation, they followed two different methods: 'Overall website performance calculation' and 'Criteria-wise website performance calculation'. Later a comparison was made between 19 institutes with national importance (Indian Institute of Technology (IITs) and Indian Institute of Management (IIM) and the 20 central universities. This study revealed that in terms of content awareness, central universities were lacking behind the institutes of national importance. Chua & Goh[10] did a study on 120 public and academic libraries from three different regions Asia, Europe, and North America; to examine the usage of web 2.0 applications into the library websites. They identified that libraries had incorporated different web 2.0 tools to enhance information dissemination and user awareness, i.e., blogs, instant messaging tools, social media platforms, wiki, social tagging, etc.

Hence, it is cleared that various studies have already been conducted in analyzing the website of the academic libraries, but nothing has done about the preparedness of the academic libraries of India to address the pandemic situation. Therefore, the study aims to examine the readiness of Indian academic libraries to provide effective services to their users in perilous situation.

3. OBJECTIVES

- To study the preparedness of the Indian academic libraries during the pandemic.
- To rate the institutes according to the scores obtained under the library preparedness index.

Table 1. Evaluation criteria

Category	Sections/Sub-categories
Appearance of the Website	Dedicated website
	Website accessibility for disable persons
	Translate facilities inside the website
	Search function
	Smartphone Application (App)
	News-update
	Pandemic information
	Online Handbook
	User education
	News-clippings
Resource Discovery	Single-window discovery
	Web-OPAC
	Personalised OPAC
	Renewal service
	Interactive Features
	New arrival
Availability of Resources	Off-campus access
	Institutional repository
	OA resources
	e-learning courses
	DELNET/ILL
	Bibliographic databases
	Question papers
	COVID-19 resources
	Online-DDS
Reference Service	Research aids
	Plagiarism
	Ask-a-Librarian
	Social media
	Chat-widget/feedback

- To understand the relationship between preparedness index and NIRF ranking.

4. METHODOLOGY

The present study was undertaken on the premise of the readiness of academic libraries in providing basic services during this pandemic. Hence, the sample for this study consists of the top 100 NIRF[11] (National Institute of Ranking Framework) 2020 ranked institute websites central library under the 'overall category'. The overall category covers all Indian Institutes of Technologies (IITs), National Institute of Technologies (NITs), Indian Institute of Science Education and Research (IISERs), central, state, and private universities and

Table 2. Preparation index with corresponding grade

Level of preparedness index (%)	Grade
90 – 100	A^+ (Outstanding/Exceptional)
70 – 89	A (Excellent)
50 – 69	B (Good)
30 – 49	C (Acceptable)
Below 30	D (Unacceptable)

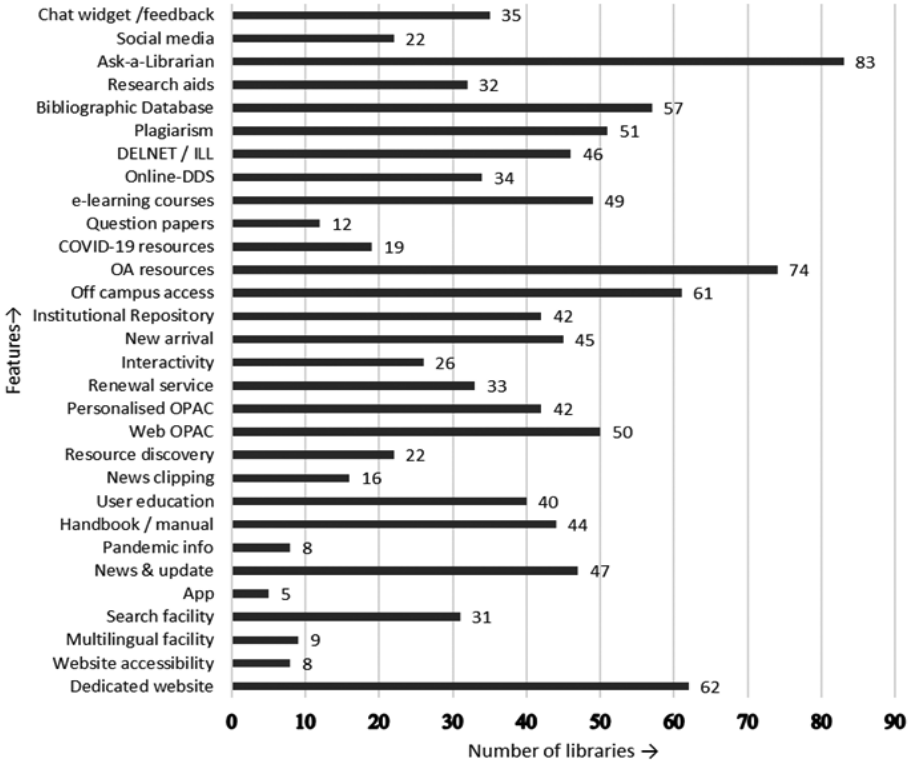

Figure 1. Status-of-availability of defined criteria.

in this case of multi-campus institutions only the main campus was taken into consideration.

In this study, the 'Preparedness Index' was used to measure the effectiveness of academic libraries in response to emergencies such as the Covid-19 pandemic. It is a popular assessment tool used to measure the relative levels of various interrelated factors. It represents a set of indicators and through some mathematical measurement, these factors are manipulated to get a single value known as 'index'. It is used for comparative studies based on certain parameters. It is a valid and reliable tool for assessing the level of preparedness of academic libraries to face any adversity that forms the basis of the study. Here, the index is used to measure the preparedness of various academic libraries towards the Covid-19 pandemic based on four factors, namely, the appearance of the website, resource discovery, availability of resources, and reference service (Table 1). These four factors further subdivided into 30 parameters which were considered essential for every library to face this pandemic or similar situation and provide timely services to library users. Scores were assigned to each library based on status-of-availability of defined criteria, where the presence of an attribute was labelled as 1 otherwise 0. Moreover, inactive links of a particular parameter were excluded from the analysis. The entire process of data collection was conducted from 1 October 2020 to 15 October 2020. Mathematically Preparedness Index can be expressed as:

$$\text{Preparedness index} = \frac{\sum_{i=1}^{N} a_i}{N} \times 100\%$$

Where,
a_i = Points on availability status based on set criteria,
N = Total number of set criteria.

All mathematical calculations and graphical visualisations were performed in Microsoft Excel software. For better understanding, the values of the preparedness index were categorised under five groups as Table 2:

5. ANALYSIS AND RESULT

Figure 1 discloses the status-of-availability of the predefined criteria, and depending on the following comments have made.

5.1 The Appearance of the Library Website

62 per cent of institutes have a dedicated website for their library that increases visibility in the virtual environment. 8 per cent of libraries provide web-accessibility features for differently-abled users. Keeping in mind the multilingualism status of India, 9 per cent of libraries have enabled translation facility on their respective website. For easily finding required information from the entire website 31 per cent of libraries have enabled browsing feature. To facilitate dynamic access on the website 5 per cent of libraries have developed smartphone application (App) for users. 47 per cent of libraries continuously provides update their users about newly adopted services, and related information through the 'New-Update' block. 8 per cent of libraries guide and alert users by providing information regarding pandemic generated by authorised bodies. 44 per cent of libraries have provided users' manual or handbook on the library. Further, 40 per cent of libraries have enabled user education programme. 16 per cent of libraries aware of their users of important news contents through 'News-clipping'.

5.2 Resource Discovery

22 per cent of libraries have included single-window search feature into their respective website. Various libraries have the web-OPAC facility, however, only 50 per cent of them

are explorable over the internet, rest of the others are restricted into campus LAN. 33 per cent of libraries have enabled online renewal facility for their users. 26 per cent of libraries have incorporated interactive features into web-OPAC. 45 per cent of libraries enabled the 'New-Arrival' block to display newly arrived items into the library.

5.3 Access to E-Resources

To enable access to the subscribe resources for the off-campus users 61 per cent of libraries have acquired different types of remote-access tools. 74 per cent of libraries have listed the links of popular OA content providers. 42 per cent of libraries have their institutional repository which is publicly accessible.19 per cent of libraries have listed the links of COVID-19 resources providers from different sources. 49 per cent of libraries have developed e-learning platform and(or) listed popular e-learning courses from recognised sources on their website. 34 per cent of libraries have found in supporting online-DDS while users couldn't find their requirement contents by themselves. 46 per cent of libraries support DELNET/ILL service in the situation when an item is not available in a library. The facility to access the bibliographic database is confirmed by 57 per cent of libraries.

5.4 Reference Service

32 per cent of libraries provide popular research tools for their research scholars. To keep research outputs plagiarism-free, 51 per cent of libraries have initiated the plagiarism checking service. Users of 83 per cent of libraries can directly contact the librarian through the 'Ask-a-Librarian' service. 22 per cent of libraries have acquired social media as a medium of disseminating information. To fit with continuously evolving users' need, 35 per cent of libraries have embodied chat-widget or feedback service.

5.5 Grading

Using the Preparation Index formula, the scores are assigned to the Institutes and then they are sorted according to their respective score in descending order (Annexure I). Then to classify and define the level of preparedness of the concerned libraries, the values of the preparedness index are being categorised into five scales; 90-100: A+(Exceptional), 70-89: A (Excellent), 50-69: B (Good), 30-49: C (Barely Acceptable); Below 30: D (Unacceptable). Annexure I clears that not a single library is qualified for Group-A^+. Only 3 per cent of libraries belong to Group-A. 19 per cent of libraries belong to Group-B. 28 per cent of the libraries belong to Group-C. 39 per cent of libraries failed to score 30 per cent and are kept under Group-D. Annexure I also indicates that the value of the preparedness index of the last 10 libraries is zero. In Annexure I: A^+ (Exceptional) $\geq$ 90; A (Excellent) $\geq$ 70; B (Good) $\geq$ 50; C (Barely Acceptable) $\geq$ 30; D (Unacceptable) < 30.

5.6. Correlation Between NIRF Rank and Preparedness Index based Rank

To identify the relationship between the NIRF ranking and preparedness index-based ranking, Spearman's rank-order correlation analysis has been done. In this analysis correlation coefficient (r_s) value relays between (-)1 to (+)1; where negative signs are for negative and positive for positive correlation respectively and mathematically can be expressed in the following way,

$$r_s = 1 - \frac{6\sum_{i=1}^{n} d_i^2}{n(n^2-1)}$$

Where,
r_s = Spearman's rank-order correlation coefficient,
d_i = Difference between paired ranks,
n = Number of observations.

In Annexure I it can be seen that two or more institutes scored the same value. In such a case, the tied observations receive the same average rank in calculating the spearman rank-order correlation coefficient[12]. For example, if three observation in a particular situation tied for the 5th rank, while their ranks are 5, 6, and 7. The average rank of these three observations is 6. This rank will be assigned to each of the three observation.

From Annexure II, we get the value of $\sum_{i=1}^{n} d_i^2 = 106939.50$. By putting the same along with $n(n^2-1) = 99900$ where n=100 into the spearman's correlation coefficient equation, we get the coefficient value ($r_s \approx$) 0.36, which indicates that there is a positive but weak correlation exist between NIRF rank and the rank based on the Preparedness index. Linear expression of these two rankings has been reflected in Fig. 2, where the dotted line specifies the weak trend of the correlation.

From this analysis, it confirms that if an institute got a higher rank in the 'overall' section of the NIRF ranking does not mean their library is also equally capable to get a rank in higher-order in Annexure I.

6. DISCUSSION

It is observed from the analysis of the study that most of the library failed to secure half of the score on the predefined parameter of evaluation. Out of 30 parameters only 7 indicators viz 'Ask-a-Liberian', 'Open access resources', 'dedicated website', 'off-campus access', 'plagiarism detection tools' and 'bibliographic databases' service indicators are common to the majority of the library websites whereas 'smart library application' service is least one. The analysis concerning the other parameters did not yield any conclusive result. It was found that IIT Delhi is ranked one according to the preparedness index. The study also reveals that most of the libraries have been started promoting e-learning courses through different MOOCs program. Irregularity about updating the library website was common in most of the libraries. It was observed that the sampled library websites were very authentic and informative but less user-friendly. However, it was ascertained that libraries providing social media feature were less in number although India is the 2nd largest social media users just after China[13]. During the pandemic, various publishers produce and share pandemic related resources, but the study indicates that very few libraries have been providing those reading materials on their website. In the account of preparedness, it

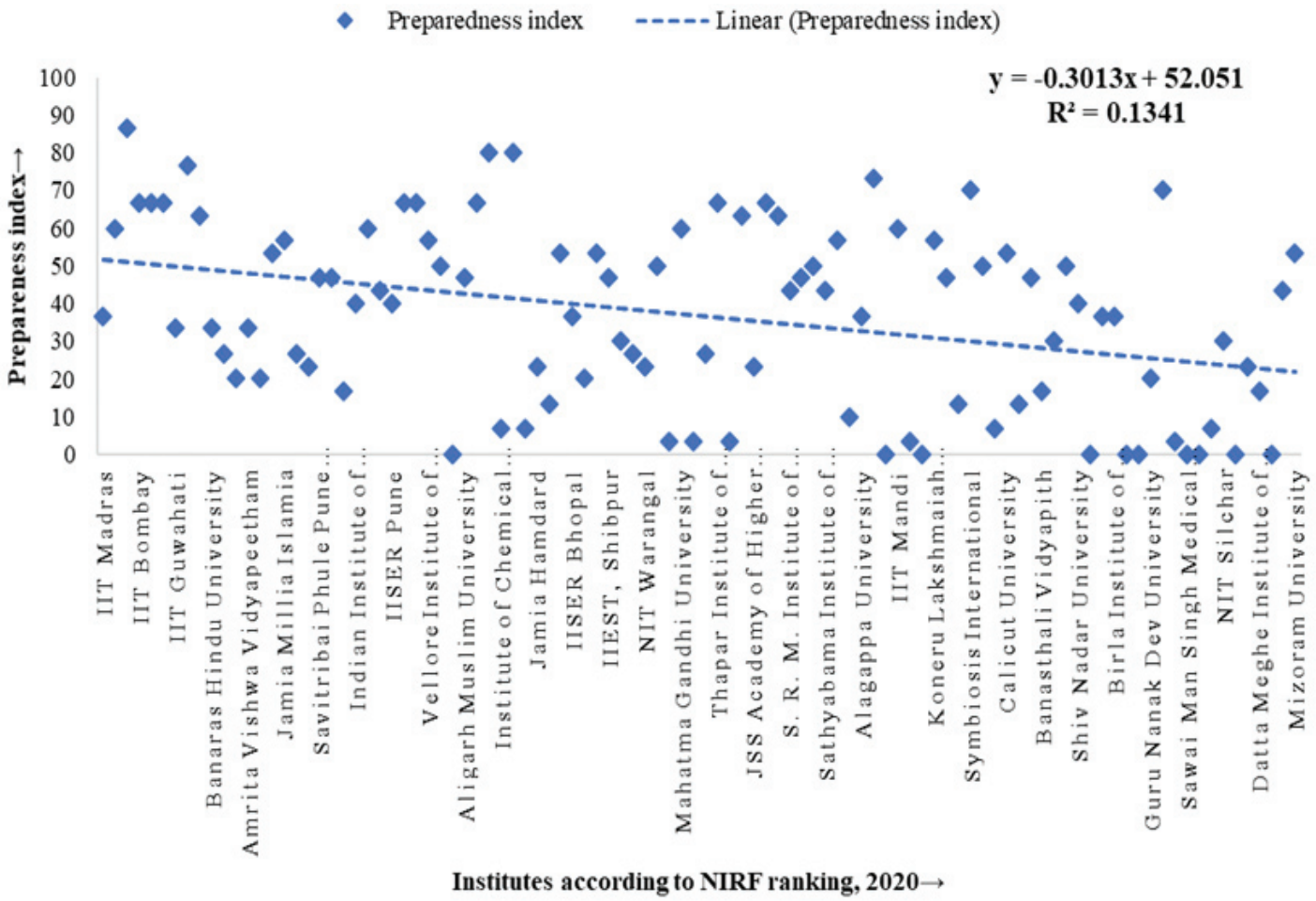

Figure 2. Preparedness index vs NIRF ranking.

has been noticed that no such new services have been included that promotes e-learning among users and able to face the challenges due to pandemic[1].

7. CONCLUSION

By analysing the websites of libraries of the top 100 academic institutions in India, the study seeks to draw a summary of library services through their websites during this pandemic situation. Overall findings of this study suggest the inclusion of improved web-based services by the academic libraries, which is the need of library users in this digital era. This study has also tried to understand the relationship between ranks as per the preparedness index and NIRF ranks of the institutes. From the findings, it is clear that there is no such relationship exists between these ranks. So, it can be said that an institute that got a rank in NIRF ranking does not mean that their preparedness index is also good.

Moreover, by setting aside the overall results of this study at one end and inspecting individual features, it can be stated that libraries have started reviving from different aspects to deal with this pandemic situation. For example, alerting the users through sharing pandemic info, educating users through 'user education', providing remote access on subscribed materials, sorting down the COVID-19 information, listing down free and open access contents from different sources, facilitating e-learning courses materials, providing online-DDS against unavailable contents, enabling chat-widget or feedback service to help users who have trouble in accessing library services. It is also true that the availability of these features is not so much noticeable, but the presence of these features confirms that libraries have started to put their efforts to deal with this epidemic situation. Hence, the COVID-19 pandemic acts as an eyeopener for library professionals in making necessary changes to their library planning in an emergency.

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CONTRIBUTORS

Mr Anupta Jana is a JRF at the School of Library and Information Science, Gangadhar Meher University, Sambalpur.
His contribution to this study: research concept, data retrieval and overall contribution.

Dr. Rosalien Rout is currently working as an 'Assistant Professor' at the School of Library and Information Science, Gangadhar Meher University, Sambalpur. She holds her PhD degree from the University of Calcutta, West Bengal. Her area of interest includes Knowledge Organisation; Cataloguing; Information Storage and Retrieval; Information Technology Application; Research Methods.
Her contribution to this study are reviewing of literature, bringing necessary changes in the introduction, methodology and conclusion parts of this study.

Annexure I. Rank of the institutes according to scores

New rank	Institutes	Score	Preparedness index	Grade
1	IIT Delhi	26	86.67	A
2	NIT Karnataka	24	80.00	A
3	IIT Gandhinagar	24	80.00	A
4	Jawaharlal Nehru University	23	76.67	A
5	Tezpur University	22	73.33	A
6	Symbiosis International	21	70.00	A
7	Cochin University of Science and Technology	21	70.00	A
8	IIT Bombay	20	66.67	B
9	IIT Kharagpur	20	66.67	B
10	IIT Kanpur	20	66.67	B
11	IIT Varanasi	20	66.67	B
12	Birla Institute of Technology & Science	20	66.67	B
13	NIT Rourkela	20	66.67	B
14	Thapar Institute of Engineering & Technology	20	66.67	B
15	IIT Bhubaneswar	20	66.67	B
16	IIT Roorkee	19	63.33	B
17	IIT Patna	19	63.33	B
18	Tata institute of Social Sciences	19	63.33	B
19	Indian Institute of Science	18	60.00	B
20	IIT Indore	18	60.00	B
21	Mahatma Gandhi University	18	60.00	B
22	IIT Mandi	18	60.00	B
23	Jamia Millia Islamia	17	56.67	B
24	Vellore Institute of Technology	17	56.67	B
25	Delhi Technological University	17	56.67	B
26	Koneru Lakshmaiah Education Foundation University	17	56.67	B
27	University of Hyderabad	16	53.33	B
28	IIT Ropar	16	53.33	B
29	Kerala University	16	53.33	B
30	Calicut University	16	53.33	B
31	Mizoram University	16	53.33	B
32	IISER Kolkata	15	50.00	B
33	Mysore University	15	50.00	B
34	Gujarat University	15	50.00	B
35	North Eastern Hill University	15	50.00	B
36	Pondicherry University	15	50.00	B
37	Savitribai Phule Pune University	14	46.67	C
38	Anna University	14	46.67	C
39	Aligarh Muslim University	14	46.67	C
40	IIEST, Shibpur	14	46.67	C
41	IISER Mohali	14	46.67	C
42	Malaviya National Institute of Technology	14	46.67	C
43	University of Kashmir	14	46.67	C
44	NIT Tiruchirappalli	13	43.33	C
45	S. R. M. Institute of Science and Technology	13	43.33	C
46	Sathyabama Institute of Science and Technology	13	43.33	C
47	Lovely Professional University	13	43.33	C
48	Indian Institute of Technology (Indian School of Mines)	12	40.00	C
49	IISER Pune	12	40.00	C
50	Shiv Nadar University	12	40.00	C
51	IIT Madras	11	36.67	C
52	IISER Bhopal	11	36.67	C
53	Alagappa University	11	36.67	C
54	Madurai Kamaraj University	11	36.67	C

Annxure I. Rank of the institutes according to scores

New rank	Institutes	Score	Preparedness index	Grade
55	Birla Institute of Technology, Ranchi	11	36.67	C
56	IIT Guwahati	10	33.33	C
57	Banaras Hindu University	10	33.33	C
58	Amrita Vishwa Vidyapeetham	10	33.33	C
59	IIT Hyderabad	10	33.33	C
60	Panjab University	9	30.00	C
61	IISER Thiruvananthapuram	9	30.00	C
62	NIT Silchar	9	30.00	C
63	Kalinga Institute of Industrial Technology	8	26.67	D
64	Sri Ramachandra Institute of Higher Education and Research	8	26.67	D
65	Calcutta University	7	23.33	D
66	University of Delhi	7	23.33	D
67	Jamia Hamdard	7	23.33	D
68	NIT Warangal	7	23.33	D
69	JSS Academy of Higher Education and Research	7	23.33	D
70	NIT Durgapur	7	23.33	D
71	Jadavpur University	6	20.00	D
72	Manipal Academy of Higher Education	6	20.00	D
73	University of Madras	6	20.00	D
74	Guru Nanak Dev University	6	20.00	D
75	Bharathiar University	5	16.67	D
76	Banasthali Vidyapith	5	16.67	D
77	Datta Meghe Institute of Medical Sciences	5	16.67	D
78	Siksha `O` Anusandhan	4	13.33	D
79	Gauhati University	4	13.33	D
80	Bharathidasan University	4	13.33	D
76	Banasthali Vidyapith	5	16.67	D
77	Datta Meghe Institute of Medical Sciences	5	16.67	D
78	Siksha `O` Anusandhan	4	13.33	D
79	Gauhati University	4	13.33	D
81	Amity University Noida	3	10.00	D
82	Institute of Chemical Technology	2	6.67	D
83	Andhra University	2	6.67	D
84	Dr. D. Y. Patil Vidyapeeth	2	6.67	D
85	Motilal Nehru National Institute of Technology	2	6.67	D
86	Shanmugha Arts Science Technology & Research Academy	1	3.33	D
87	King George`s Medical University	1	3.33	D
88	Osmania University	1	3.33	D
89	Sri Venkateswara University	1	3.33	D
90	University of Jammu	1	3.33	D
91	Homi Bhabha National Institute	0	0.00	D
92	Saveetha Institute of Medical and Technical Sciences	0	0.00	D
93	Visva Bharati	0	0.00	D
94	Sri Sivasubramaniya Nadar College of Engineering	0	0.00	D
95	PSG College of Technology	0	0.00	D
96	Bharath Institute of Higher Education & Research	0	0.00	D
97	Sawai Man Singh Medical College	0	0.00	D
98	SVKM`s Narsee Monjee Institute of Management Studies	0	0.00	D
99	Mumbai University	0	0.00	D
100	Bharati Vidyapeeth	0	0.00	D

Annexure II. NIRF ranking corresponding to average ranking

NIRF rank(R_1)	Preparedness index (PI)	PI based average rank(R_2)	d (=R_1-R_2)	d^2
1	36.67	53	-52.00	2704.00
2	60.00	20.5	-18.50	342.25
3	86.67	1	2.00	4.00
4	66.67	11.5	-7.50	56.25
5	66.67	11.5	-6.50	42.25
6	66.67	11.5	-5.50	30.25
7	33.33	57	-50.00	2500.00
8	76.67	4	4.00	16.00
9	63.33	17	-8.00	64.00
10	33.33	57	-47.00	2209.00
11	26.67	63.5	-52.50	2756.25
12	20.00	72.5	-60.50	3660.25
13	33.33	57	-44.00	1936.00
14	20.00	72.5	-58.50	3422.25
15	53.33	29	-14.00	196.00
16	56.67	24.5	-8.50	72.25
17	26.67	63.5	-46.50	2162.25
18	23.33	68	-50.00	2500.00
19	46.67	40	-21.00	441.00
20	46.67	40	-20.00	400.00
21	16.67	76	-55.00	3025.00
22	40.00	49	-27.00	729.00
23	60.00	20.5	2.50	6.25
24	43.33	45.5	-21.50	462.25
25	40.00	49	-24.00	576.00
26	66.67	11.5	14.50	210.25
27	66.67	11.5	15.50	240.25
28	56.67	24.5	3.50	12.25
29	50.00	34	-5.00	25.00
30	0.00	95.5	-65.50	4290.25
31	46.67	40	-9.00	81.00
32	66.67	11.5	20.50	420.25
33	80.00	2.5	30.50	930.25
34	6.67	83.5	-49.50	2450.25
35	80.00	2.5	32.50	1056.25
36	6.67	83.5	-47.50	2256.25
37	23.33	68	-31.00	961.00
38	13.33	79	-41.00	1681.00
39	53.33	29	10.00	100.00
40	36.67	53	-13.00	169.00
41	20.00	72.5	-31.50	992.25
42	53.33	29	13.00	169.00
43	46.67	40	3.00	9.00
44	30.00	60	-16.00	256.00
45	26.67	63.5	-18.50	342.25
46	23.33	68	-22.00	484.00
47	50.00	34	13.00	169.00
48	3.33	88	-40.00	1600.00
49	60.00	20.5	28.50	812.25
50	3.33	88	-38.00	1444.00
51	26.67	63.5	-12.50	156.25
52	66.67	11.5	40.50	1640.25
53	3.33	88	-35.00	1225.00
54	63.33	17	37.00	1369.00
55	23.33	68	-13.00	169.00
56	66.67	11.5	44.50	1980.25
57	63.33	17	40.00	1600.00
58	43.33	45.5	12.50	156.25
59	46.67	40	19.00	361.00
60	50.00	34	26.00	676.00
61	43.33	45.5	15.50	240.25
62	56.67	24.5	37.50	1406.25
63	10.00	81	-18.00	324.00
64	36.67	53	11.00	121.00
65	73.33	5	60.00	3600.00
66	0.00	95.5	-29.50	870.25
67	60.00	20.5	46.50	2162.25
68	3.33	88	-20.00	400.00
69	0.00	95.5	-26.50	702.25
70	56.67	24.5	45.50	2070.25
71	46.67	40	31.00	961.00
72	13.33	79	-7.00	49.00
73	70.00	6.5	66.50	4422.25
74	50.00	34	40.00	1600.00
75	6.67	83.5	-8.50	72.25
76	53.33	29	47.00	2209.00
77	13.33	79	-2.00	4.00
78	46.67	40	38.00	1444.00
79	16.67	76	3.00	9.00
80	30.00	60	20.00	400.00
81	50.00	34	47.00	2209.0
82	40.00	49	33.00	1089.0
83	0.00	95.5	-12.50	156.25
84	36.67	53	31.00	961.00
85	36.67	53	32.00	1024.0
86	0.00	95.5	-9.50	90.25
87	0.00	95.5	-8.50	72.25
88	20.00	72.5	15.50	240.25
89	70.00	6.5	82.50	6806.2
90	3.33	88	2.00	4.00
91	0.00	95.5	-4.50	20.25
92	0.00	95.5	-3.50	12.25
93	6.67	83.5	9.50	90.25
94	30.00	60	34.00	1156.00
95	0.00	95.5	-0.50	0.25
96	23.33	68	28.00	784.00
97	16.67	76	21.00	441.00
98	0.00	95.5	2.50	6.25
99	43.33	45.5	53.50	2862.25
100	53.33	29	71.00	5041.00
			$\sum_{i=1}^{n} d_i^2 =$	106939.50