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Awareness, Usability, and Challenges of the National Digital Library of India (NDLI): Evidence from Engineering Colleges in the Mumbai Region

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Abstract

National Digital Library of India (NDLI) has emerged as a significant digital initiative that offers. teaching facilities to every citizen in India. This research examines the engineering college students. and faculty members of the Mumbai Region know and apply NDLI and confront its operational. difficulties. Four hundred and thirty-nine respondents (377 students and 62 faculty) took part.in the study. The researchers examined non-normal data distribution through descriptive statistics and non-parametric testing methods, which included the Wilcoxon Signed-Rank Test and the Mann-Whitney U Test. The results show that users of NDLI find high levels of satisfaction because they can access academic content that meets their needs. The effect size analysis shows that NDLI usage has a strong effect on learning outcomes. The users face three main obstacles, which include their lack of knowledge about advanced functions, difficulties in navigating the system, and restrictions on access. The study identifies specific training requirements that must be met through the development of better interface designs to enhance user experience. The research establishes that NDLI serves as an essential resource for digital educational development in engineering programs, while it offers multiple opportunities to enhance India's knowledge development system.

Keywords: National Digital Library of India (NDLI), Digital Libraries, Engineering Education, Usability, User Awareness, E-learning, India

1.Introduction

Digital technology has advanced quickly, which has created new teaching methods and learning approaches, and academic resource distribution methods that now exist in higher education. The development of digital libraries has become essential because these libraries enable people to access academic resources through remote access methods that are both efficient and inexpensive. Digital libraries provide users with 24/7 access to academic materials which enables them to study at their own pace and follow their personal learning paths (Arms, 2000; Borgman, 2000).

The Indian government needed a unified digital knowledge system, which resulted in the creation of the National Digital Library of India (NDLI), which serves as a main educational project for the Government of India and the Ministry of Education, and the Indian Institute of Technology Kharagpur developed this project. Through its single-window system, NDLI offers access to millions of digital educational materials, which include e-books, research articles, theses, audio-visual materials, and course content from various fields and educational levels. NDLI plans to connect students with high-quality educational content through its platform, which combines resources from both national and international educational institution repositories.

The engineering education field depends on digital libraries since students need current technical resources and research materials, as well as multimedia educational resources. Engineering education requires students to solve problems through their innovative work on practical learning activities, which need access to trustworthy educational resources. The NDLI platform, together with NPTEL and SWAYAM digital programs, helps improve

technical education through its support of mixed and virtual learning environments, according to the Government of India 2020 report.

The success of digital platforms depends on two main factors, which include users' knowledge about the platform and their ability to operate it, and their ability to navigate its features. The research demonstrates that digital libraries provide users with significant advantages, yet many users choose not to use them because they do not understand the system. After all, the search interface is difficult to use, and it cannot reach certain material. The evaluation process needs to assess both resource availability and the user experience that digital platforms deliver to their customers.

Sustainability has become a significant concept for digital libraries due to the fact that it propels them operational processes. Digital libraries are sustainable in enabling educational practices through their capability. to reduce physical resources requirements, reduce expenditures, and increase their capacity to offer equal education. access. Specifically, NDLI relates to the goals of the National Education Policy (NEP) 2020, which emphasizes digital infrastructure, lifelong learning, and equal access (Government of India, 2020). NDLI has not been evaluated in terms of its usability and effectiveness in engineering education in the Mumbai area. studied through empirical research. Digital library adoption has been researched, although it has been noted that the research studies are limited. have not investigated yet how students and faculty members of technical institutions perceive and use. NDLI and what hinders its successful implementation.

1.1 Research Gap

The literature indicates a lack of focused studies on:

- NDLI usage in engineering colleges
- Statistical validation of usability and satisfaction
- Comparative analysis of students and faculty perspectives
- Identification of practical challenges affecting NDLI adoption

1.2 Objectives Of The Study

To fill this gap, the given research will:

1. To determine the degree of NDLI awareness among engineering college students and faculty.
2. To evaluate the usability and user satisfaction with NDLI resources and interface.
3. To determine the difficulties and barriers experienced by users in accessing NDLI.
4. To examine the effects of the NDLI use on the academic activities by statistical means.

2.Literature Review

With the advent of digital libraries, which enable easy access, higher education has transformed radically. Availability of academic resources and support for independent learning. Borgman works as a founder. Arms (2000) and (2000) defined digital libraries as systems that enable users to access. combined manner of learning and sharing knowledge and that bypass most of the constraints of print-based libraries in terms of accessibility as well as scalability.

The results of other studies indicate that the digital content (e.g., electronic books, electronic journals, etc.) can be utilized in electronic databases) are gaining more and more significance in higher education. For example, Nicholas

According to et al. (2008), a number of users like digital materials due to the convenience of use and the possibility of access on the spot; Tenopir (2012) reported that digital materials are significant in enhancing the level of

productivity and scholarly output by the researchers. Usability is also an important factor in the adoption of digital libraries. Thong et al. (2002) stated that the major contributors to user satisfaction include system quality, information quality, and interface quality. Joo and Choi (2015) described the importance of navigation, searching, and personalization. These findings were consistent with the Technology Acceptance Model (Davis, 1989), which identified perceived usefulness and perceived ease of use as key determinants of technology acceptance.

The successful establishment of the National Digital Library of India (NDLI) is a significant step for India to provide and aggregate all kinds of educational materials centrally. NDLI, developed by IIT Kharagpur under the aegis of the Ministry of Education, is a unifying platform that brings together educational material from various national & international repositories, thus enabling students from all disciplines access to a wide array of educational material. Compared to past studies by Singh & Chakraborty (2020) or Kumar & Singh (2021), NDLI increases student access and digital literacy in academic institutions, but lacks public awareness or effective use.

The digital library has always played an essential role in engineering education, which constantly requires updated technical/research-oriented materials. Digital libraries such as NDLI, NPTEL, or SWAYAM help provide students with creative and innovative ways to learn through blended learning – combining traditional with technology-mediated methods of teaching (GOI, 2020). Also, digital libraries have the potential to create sustainability by being less reliant on physical materials and offering equal access to educational materials for everyone (Chowdhury, 2010).

There is very little empirical research regarding the usage of NDLI among engineering colleges, especially concerning its usability, user satisfaction, and barriers to access/use of the digital library. The current research will fill this void by providing a statistically validated assessment of the extent of adoption of NDLI by faculty and students.

3.Research Methodology

This research adopted a quantitative methodology to evaluate user awareness, usability and constraints of the National Digital Library of India (NDLI) by students and faculty members at engineering Colleges within Mumbai. The researcher employed a survey approach to primary data collection because the approach allows for systematic. User perception and experience Digital library user perception and experience measurement. This was carried out in a number of chosen engineering colleges that were under the universities. In the City of Mumbai; a total of **439 participants** (including 377 students) were involved in the study and 62 faculty members.

A **convenience sampling technique** was used to select these people, and the technique was based on their accessibility and desire to be involved. This sample size was determined to be of sufficient size to generalize about the users' perceptions and to have sufficient statistical power to discover patterns and relationships based on NDLI usage.

The collected data was through a structured questionnaire which was designed in accordance with the study objectives and the existing research on the digital library usability. Questions in the questionnaire were: NDLI Awareness; NDLI Usage Patterns and Frequencies; Usability/Satisfaction (Likert Scale Questions) and NDLI Usage Challenges.

4. Data Analysis And Interpretation

The data obtained were processed in SPSS (Statistical Package for the Social Sciences), Version 25. Both descriptive and inferential statistical techniques were applied. The frequency, percentage, mean, and standard deviation descriptive statistics were applied to summarize the responses of the users and obtain general trends of NDLI use. The normality of data distribution was tested using the Kolmogorov-Smirnov test. The findings have shown that the data could not be represented normally ($p < 0.05$), which is why the non-parametric statistical tests should have been used.

Inferential Analysis: The non-parametric tests were as follows based on non-normal distribution of data:

One-Sample Wilcoxon Signed-Rank Test: Compared against the median value of the user response against a neutral benchmark value (median = 3), to measure satisfaction and usability.

Mann–Whitney U Test: Tested to determine discrepancies between student and faculty answers.

Effect Size Measurement: In order to find the practical meaning of the results, Rank-Biserial Correlation was computed as the measure of effect size. This assisted in knowing the size of differences that are not statistically significant.

The instrument is reliable in terms of its 3.5 Reliability: Cronbach's Alpha was used to test the reliability of the questionnaire, which guaranteed internal consistency of the measurement scale. The reliability coefficient derived was found to be within acceptable limits (0.7), meaning that the instrument was reliable in collecting data.

Research on NDLI awareness and usage: This discussion indicates that the majority of the interviewees are knowledgeable about the National Digital Library of India, with institutional initiatives, such as library orientation, faculty guidance, and academic. workshops, which are a significant determinant of awareness. The level of participation is indicated by students. was not low compared with the faculty members, more so in the application of NDLI in assignments, projects, and exam preparation. The results indicate that NDLI has been successfully implemented in engineering institutions, but the degree to which the tool is used is distinguished by the degree to which the users are familiar with it. capabilities.

Resource Utilization Patterns: The NDLI can be implemented in many forms, which are how different individuals prefer to learn. The most visited sources are:

- E-books and textbooks
- Paper-based information and research on projects.
- Bank of questions and exam preparation material.
- Video lectures and multimedia tutorials.

This tendency highlights the increasing tendency of multimodal learning when a student combines a combination of texts. and audio-visual information to enhance their understanding. The fact that NDLI has such a variety. The content makes it a more powerful digital learning platform.

Usability and Satisfaction Analysis (Wilcoxon Test): One-Sample Wilcoxon Signed-Rank Test was used to test the satisfaction of the users by comparing median responses with the neutral value (3).

Table 4.1: Wilcoxon Test Results – Students (n = 377)

Parameter	Test Statistic (Z)	Effect Size (r)	Interpretation
Satisfaction Value	9.193	0.473	Large Effect
Overview of NDLI	10.502	0.541	Large Effect
Effectiveness	9.676	0.498	Large Effect
Content Structure	7.861	0.405	Medium–Large Effect
Website Capabilities	10.152	0.523	Large Effect
Usability	9.029	0.465	Large Effect

Interpretation (Students): The results clearly indicate that all the parameters have statistically significant positive differences. The median value of the neutral. The values of the effect sizes (r between 0.405 and 0.541) indicate medium or high practical importance, which demonstrates that NDLI is highly beneficial to the student learning experiences. The greatest effect size belongs to the "Overview of NDLI, which means that students have a positive overall attitude to the platform.

Table 4.2: Wilcoxon Test Results – Faculty (n = 62)

Parameter	Test Statistic (Z)	Effect Size (r)	Interpretation
Satisfaction Value	6.052	0.769	Large Effect
Overview of NDLI	5.567	0.707	Large Effect
Effectiveness	5.355	0.680	Large Effect
Content Structure	5.880	0.747	Large Effect
Website Capabilities	5.891	0.748	Large Effect
Usability	4.740	0.602	Large Effect

Interpretation (Faculty): The response of the faculty also shows statistically significant values at all the parameters with significant effect sizes ($r > 0.60$). This means that there is a very high perception of NDLI in teaching, research, and access to academic resources. Faculty members have slightly higher effect sizes than students do, indicating that they value the academic value of NDLI more.

Comparative Insights (Students vs Faculty): The discussion shows that students and faculty have a positive perception of NDLI, though there is a difference in the levels of usage and perception. The NDLI is mostly used by students in their academic activities like assignments and preparing exams, and faculty members in research and teaching assistance. The greater effect size values of the faculty show greater perceived usefulness whereas students show greater frequency of use. This shows that there is a necessity to design specific strategies to enhance the level of engagement among both categories of users.

5. Results And Discussion

CHALLENGES AND BARRIERS: Although the positive results were obtained, some challenges were outlined:

- Poor knowledge of advanced search and filtering.
- Slow navigation and various links to resources.
- Hardly able to access restricted or copyrighted content.
- Technical problems like slowness in loading and unreliability of the system.
- Poor digital literacy among some of the users.

Such findings are related to previous research on digital library usability that has highlighted the issue of user training and interface design in improving adoption.

Discussion: These findings affirm that NDLI is a very useful digital learning tool in engineering courses. The statistically significant outcomes and high effect sizes mean that NDLI has a positive impact on academic engagement, student outcomes, and access to resources. Theoretically, the results can be supported in terms of the Technology Acceptance Model (Davis, 1989), in which perceived usefulness and ease of use are the factors that influence system adoption. Although NDLI scores well in the area of usefulness, the usability issues show that there are some aspects to be improved. In addition to these, NDLI promotes sustainable learning by reducing the use of physical resources and minimizing dependence on physical resources enabling access to knowledge for everyone. Its presence in engineering learning is a contribution to innovation, research, and skill development, and aligns with the national policies such as NEP 2020.

Conclusion

The awareness, usability, and challenges surrounding the National Digital have been examined in the current paper. The library of India, with the students and faculty of engineering colleges in the Mumbai region. The results show that NDLI is now a leading online platform that enables academic and research activities in technical education. The extent of awareness and utilization of the respondents. was high and a good percentage of the NDLI users are primarily in academic assignments, project. and study, and the preparation of examinations, and the members of the faculty are the most frequent users of it in. Statistical measure offered (the Wilcoxon Signed-Rank Test) has demonstrated that the level of user. Satisfaction is considerably stronger than the level of neutrality, which represents a positive attitude towards NDLI in conditions of the content availability, its accessibility, and the usability in general. In addition, the effect size analysis indicated that there was a presence of medium-large effects between students and always large ones between.

Faculty members which demonstrates that NDLI use has a considerable and practical impact on academic. interaction and learning results. Although these findings are positive, the study has also come up with a number of challenges that

Stop the perfect use of NDLI. These consist of ignorance with regard to the advanced search features, a lack. of having access to restricted materials, a sense of difficulty in navigation due to the existence of various connections, and technical issues, such as the slowness of the system. These obstacles point to the mismatch between the availability and efficient utilization of resources, indicating a need to enhance the system constantly and take into account the requirements of users. In a broader perspective, NDLI is making significant contributions towards developing a sustainable and inclusive education. environment by providing equal access to knowledge material

and reducing the dependence on. physical resources. It also corresponds to the national priorities of education, in particular, the digital aspects. transformation, as well as the National Education Policy (NEP) 2020. Overall, the findings of the research. suggest that NDLI is an efficient and valuable digital project that has a great prospect of enhancing the quality. as far as the existing problems are dealt with in a proper manner.

Recommendations

The results of the research will be used to offer a number of practical suggestions on how NDLI may be applied to enhance the efficiency and practice in engineering education.

Firstly, there is a need to raise awareness and training programs within institutions. An orientation session, regular workshops, and hands-on training sessions should be undertaken to train users on the advanced search methods, filters, and navigation of the resources. The incorporation of Academic induction training provided by NDLI can do wonders in improving user engagement.

Second, it is important to improve the usability of the system and interface design. The overall user experience may be enhanced through a more user-friendly user interface, reduction of unnecessary links, and enhancing search facilities. Such aspects as suggested materials and the user are personalized. The dashboard will be enhanced.

Thirdly, access to restricted and copyrighted materials should be enhanced by creating institutional authentication protocols and subscriptions by the institutions. This will make sure that users are not limited with regard to access to more academic content.

Fourth, the functionality of technical infrastructure and platforms has to be enhanced to address the issues of slow loading and instability of the system. The user satisfaction and reliability will be enhanced by continuous monitoring and upgrading of the system.

Fifthly, awareness and collaborative learning can be greatly improved by promoting NDLI Clubs and peer-learning programs. These platforms can be used by the campuses as knowledge-sharing hubs, user interaction, and training centers.

Finally, an effort should be made to make the users, in particular, more digitally literate. These are the first-time users and the faculty members who may require additional help. Multilingual support and user assistance can be provided to improve accessibility and inclusivity as well

To sum up, the successful application of these suggestions can greatly increase the usability. NDLI has been a very effective digital knowledge platform of accessibility and general effectiveness. engineering schooling and so on.

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