ORIGINAL ARTICLE

Reengineering of Library Print and E-Resources for the New Generation: A Study of IIT Libraries of North India

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ABSTRACT

Background: The reengineering of library print and electronic resources services is essential for IIT libraries to adapt to the evolving information needs of users in a digital-first world. This paper explores the integration of print and e-resources services within IIT libraries to improve accessibility, enhance user satisfaction, and optimize resource utilization.

Aim: The primary aim of this study is to investigate the reengineering of IIT library print and e-resources services, focusing on how libraries can enhance access, improve management, and create a seamless experience for users through the integration of both formats.

Objectives: To examine technological advancements that can support the reengineering of print and digital resources within libraries. To identify strategies for improving access to print and e-resources, ensuring users can easily locate, borrow, and utilize materials in both formats.

Material: The research is based on a combination of primary and secondary materials. Primary data is collected through questionaries' from library users. These insights are supplemented by case studies of libraries that have successfully reengineered their print and e-resources services.

Results: Analysis showed a considerable difference between the changing levels of usage and frequency of library e-resources and print resources. The data indicate a notable difference in user satisfaction regarding the utilization of e-resources compared to print resources.

Conclusion: Reengineering library print and e-resources services is essential for modernizing library operations and enhancing user experience. The integration of print and digital resources allows libraries to provide more flexible, accessible, and efficient services to their users.

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INTRODUCTION

Background: This evolving model introduces innovative services that address the need for a shift in academic libraries. These libraries are no longer merely collections of books, journals, and articles for research and teaching. Instead, they are becoming hubs for collaboration and the creation of knowledge[1]. Often described as the age of digital information, the 21st century is characterized by the widespread use of electronic content, such as e-books, digital archive and various online resources.

The current electronic information system must enable users to access information at any time and from any location. One key aspect of electronic information is the evolving digital landscape that students now inhabit, surrounded by abundant internet resources, increasing volumes of digital content, and a large series of mobile devices[2]. Libraries are a critical part of the higher education infrastructure, and as such, they must redesign their services not only by redefining the roles of individual library staff also by rethinking the overall organizational structure to eliminate redundant tasks and make better use of staff skills and expertise[3.]

Aim and Objectives: The primary aim of this study is to investigate the reengineering of IIT library print and e-resources services, focusing on how libraries can enhance access, improve management, and create a seamless experience for users through the integration of both formats. To examine technological advancements that can support the reengineering of print and digital resources within libraries. To identify strategies for improving access to print and e-resources, ensuring users can easily locate, borrow, and utilize materials in both formats.

HYPOTHESIS

The current research aims to test the following hypotheses based on the objectives outlined above:

H_1: It is hypothesized that the usage and frequency of library e-resources have increased, while the using of print resources has decreased.

H_2: It is hypothesized that users are satisfied while using the both library e-resources and print resources.

LITERATURE REVIEW

A literature review serves as a key method for examining the current state of research, which is crucial for ongoing work. This review provides an overview of significant studies on the re-engineering of library resources and services, both globally and in the perspective of India.

Ibrahim *et al*. **(2021)**[4] carried out an online survey between medical students at Abdul aziz University to examine their preferences and understanding of the e-learning system. Their findings revealed that Blackboard mobile learning and Zoom were the most favored platforms for learning management. Approximately 60% of students approved that online learning is an effective alternative to traditional classroom education, offering greater flexibility and reduced time commitments. **Arthur and Jackson (2020)**[5] highlighted the necessity for improved communication across different technical services departments, emphasizing the importance of adopting new technologies and managing change. Their study concluded that focusing on best practices and services for various changes in management and aligning technical departments with user expectations and evolving university priorities is essential for ensuring success. **Hamad** *et al*. **(2020)**[6] explored the integration of Big Data within the context of Information Technology staff at three university libraries in Jordan. The study examined the potential challenges and opportunities of Big Data in libraries. The researchers suggested that libraries store vast amounts of data, which, if leveraged effectively, could significantly enhance the

quality of library services. They recommended that libraries utilize Big Data techniques to drive transformation, improve resource management, enhance usage patterns, and foster social engagement and intellectual growth. **Janakiraman and Subramanian (2020)**[7] examined the role and implementation of Information and Communication Technology (ICT) in libraries in Chennai for research and development. They emphasized that ICT plays a pivotal role in shaping the global economy and driving societal change. These technologies have revolutionized information management in research, leading to substantial transformations across various disciplines. As a result, libraries have increasingly sought to automate their operations to keep pace with these changes. **PK Deepa and TA Abdul Azeez (2020)**[8] investigated the use of web-based library services in universities across Kerala. Their findings discovered that while most libraries had implemented online services, the level of utilization fell short of expectations. This was primarily due to users' limited knowledge of how to effectively use web-based resources. The study recommended that targeted training and educational programs could help improve usage rates, benefiting library authorities in enhancing their services.

MATERIAL METHOD

It refers to the systematic process followed to gather, analyze, and interpret data in order to answer research questions. A self-structured questionnaire was developed to collect data from library users. While all Indian IIT libraries share common features, the study's geographical scope was narrowed to Northern India. Expanding the study over a larger region would likely compromise the validity of the results. Therefore, focusing on IIT libraries in Northern India was essential to maintain consistency and ensure meaningful outcomes.

1. Indian Institute of Technology, Jodhpur (Rajasthan)

2. Indian Institute of Technology, Roorkee (Uttarakhand)

3. Indian Institute of Technology, Delhi

4. Indian Institute of Technology, Kanpur (Uttar Pradesh)

For the sampling process, simple random sampling was employed. A total of 100 questionnaires were distributed to 100 users from each of the selected IIT libraries.

RESULTS AND DISCUSSION

Data Analysis of Users' Response

Table 1 Changing Level of Usages while reading Prints Resources in last three years

Respondents	High Increase	Increase	Decrease	High Decrease	No Change	Total
IITR	5 (5%)	28 (29%)	32 (33%)	13 (14%)	18 (19%)	96
IITD	6 (7%)	20 (22%)	24 (26%)	10 (11%)	32 (34%)	92
IITJ	8 (8%)	24 (25%)	28 (29%)	12 (13%)	24 (25%)	96
IITK	4 (4%)	13 (15%)	30 (34%)	14 (16%)	27 (31%)	88
Total	23 (6%)	85 (23%)	114 (31%)	49 (13%)	101 (27%)	372

Table 1 illustrates the changes in the use of print resources during the last three years. Across all IIT libraries, 114 users (31%) reported a decline in the usage of print resources. In contrast, 85 users (23%) indicated an increase in their usage levels. A notable proportion of users from IITR (33%), IITK (30%), and IITJ (29%) expressed that their reliance on print resources had decreased. Interestingly, 49 users (13%) across all IITs observed a significant decline in the use of print resources, while 101 users (7%) stated there had been no notable change in their usage levels. A statistical Chi-Square test was applied to analyze these differences. The results revealed significant variations in print resource usage over the last

three years. The calculated Chi-Square value of 137.24 exceeded the table value of 21.06 at 12 degrees of freedom, with a significance level of 0.05.

Table 2: Changing Level of Usages while reading electronic Resources in last three years

Respondents	High Increase	Increase	Decrease	High Decrease	No Change	Total
Changing Level of Usages while reading electronic Resources in last three years						
IITR	30 (31%)	42 (44%)	2 (02%)	0 (00%)	22 (23%)	96
IITD	24 (26%)	40 (44%)	0 (00%)	2 (02%)	26 (28%)	92
IITJ	18 (19%)	44 (46%)	2 (02%)	0 (00%)	32 (33%)	96
IITK	21 (24%)	49 (56%)	0 (00%)	0 (00%)	18 (20%)	88
Total	93 (25%)	175 (47%)	4 (1%)	2 (0.5%)	98 (26.5%)	372

Table 2 present data on changes in the usage of electronic resources. Among the respondents, 175 users (47%) reported an increase in their usage of electronic resources, while 93 users (25%) indicated a significant increase. Additionally, 98 users (26.5%) reported no major change in their patterns of usage, and only 4 users (1%) noted a decline in their use of electronic resources.

The Chi-Square test analysis reveals that the majority of users have experienced an increase in the usage of electronic resources. The test indicates a significant variation in usage levels, with a calculated Chi-Square value of 55.40 at 12 degrees of freedom and a significance level of 0.05.

Table 3: Varying Level of Frequency while reading Prints Resources in last three years

Respondents	High Increase	Increase	Decrease	High Decrease	No Change	Total
Varying Level of Frequency while reading Prints Resources in last three years						
IITR	8 (8%)	12 (13%)	34 (35%)	12 (13%)	30 (31%)	96
IITD	6 (7%)	14 (15%)	38 (41%)	9 (10%)	25 (27%)	92
IITJ	8 (8%)	16 (17%)	34 (35%)	11 (12%)	27 (28%)	96
IITK	6 (7%)	14 (16%)	30 (34%)	10 (11%)	28 (32%)	88
Total	28 (7%)	56 (15%)	136 (37%)	42 (11%)	110 (30%)	372

The data presented in Table 3 shows the frequency of print resource usage among users. A total of 136 users (37%) reported a decrease in the usages frequency of print resources, while 110 users (30%) indicated that there is no change in usage. Only 56 users (15%) experienced an increase print resources usages. In addition, the data highlights that 42 users (11%) exhibited a significant reduction in frequency of usage.

The calculated Chi-square value of 44.50 exceeds the critical value of 21.06 at 12 degrees of freedom, with a significance level of 0.05. This indicates a statistically considerable difference in the frequency of print resource usage between the users in the IITs.

Table 4: Varying Level of Frequency while reading electronic Resources in last three years

Respondents	High Increase	Increase	Decrease	High Decrease	No Change	Total
Varying Level of Frequency while reading electronic Resources in last three years						
IITR	30 (31%)	42 (44%)	2 (02%)	0 (00%)	22 (23%)	96
IITD	24 (26%)	40 (44%)	0 (00%)	2 (02%)	26 (28%)	92
IITJ	18 (19%)	44 (46%)	2 (02%)	0 (00%)	32 (33%)	96
IITK	16 (18%)	38 (43%)	0 (00%)	0 (00%)	34 (39%)	88
Total	88 (24%)	164 (44%)	4 (1%)	2 (0.5%)	114 (30.5%)	372

The data presented in Table 4 indicates the usage patterns of electronic resources among users. A total of 164 users (44%) reported an increase in the frequency of using electronic resources, while 82 users (24%) showed a significant increase in their usage. Only 4 users (1%) experienced a decrease in electronic resources usage. Additionally, 114 users (30.5%) reported no frequency changes of usage.

The calculated Chi-square value of 50.35 is higher than the critical value of 21.06 at 12 degrees of freedom, with a significance level of 0.05. This suggests a statistically significant change in the frequency of electronic resource usage.

Table 5: Satisfaction of library Users while using both Print and electronic Resources

Respondents	Fully Satisfied	Partially Satisfied	Neutral	Partially Dissatisfied	Fully Dissatisfied	Total
IITR	23 (24%)	36 (38%)	26 (27%)	9 (09%)	2 (02%)	96
IITD	30 (32%)	29 (32%)	25 (27%)	7 (08%)	1 (01%)	92
IITJ	27 (28%)	33 (35%)	24 (35%)	9 (09%)	3 (03%)	96
IITK	22 (25%)	36 (41%)	20 (23%)	8 (10%)	2 (02%)	88
Total	102 (27%)	134 (36%)	95 (26%)	33 (09%)	8 (02%)	372

Modern libraries acquire both print and electronic resources, making it essential to assess user satisfaction with these resources. From Table 5, it is observed that 134 users (36%) are partially satisfied with both print and electronic resources, while 102 users (27%) are fully satisfied. Additionally, 95 users (26%) reported a neutral stance regarding their satisfaction. Only 33 users (9%) expressed partial dissatisfaction with the resources. The calculated Chi-square value of 35.59 exceeds the critical value of 21.06 at a significance level of 0.05 with 12 degrees of freedom. This indicates a statistically significant difference in the level of satisfaction among users with both print and electronic resources.

FINDINGS

The hypotheses were developed to address the objectives of the research and to answer the research problem. They were tested using data presented in tables and figures, with the help of MS Word and MS Excel.

H_1: It is hypothesized that the usage and frequency of library e-resources have increased, while the use of print resources has decreased. Based on the analysis shown in Tables and Figures 1-4, A considerable difference among the changing levels of frequency and usage of library e-resources and print resources. Therefore, Hypothesis H_1 is accepted and validated.

H_2: It is hypothesized that the users are satisfied while using both library e-resources and print resources. The data presented in Tables 5 indicate a notable difference in user satisfaction regarding the utilization of e-resources compared to print resources. Hence, Hypothesis H_2 is confirmed and accepted.

CONCLUSION

The study reveals that libraries at IITR, IITD, IITJ, and IITK have successfully undergone re-engineering in areas such as e-resource provision, print resource management, and overall services. Despite these issues, all IIT libraries acknowledge that the re-engineering process should be implemented across all libraries, as it is essential for managing academic libraries in today's evolving landscape. The re-engineering process has positively impacted library functions by focusing on user satisfaction through the provision of quality services, redesigning ICT infrastructure, and improving library and modern information services for users.

The findings show a clear increase in the usage and frequency of e-resources and e-services over print resources and manual services. While users continue to utilize both

print and e-resources, the majority is fully satisfied with print resources and partially satisfied while using e-resources. Specifically, 36% of users are partially satisfied, and 27% are fully satisfied while using both types of resources.

SUGGESTIONS FOR FURTHER RESEARCH

The following suggestions summarize prospective directions for future research:

1. This study was conducted across four IIT libraries in Northern India. It could be extended to include all IIT libraries across the country for a more comprehensive analysis.

2. The concept of re-engineering, restructuring, or redesigning is an ongoing field of study that can be applied to various contexts. Similar research could be conducted on specific library services or across different types of libraries.

3. Future studies could explore library services at college libraries, state universities, central universities, and private universities across India.

This study endow with valuable insights for library professionals looking to redesign and innovative library services. It serves as an important opportunity for academic libraries to reorganize and enhance support for higher education.

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