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Usability Test of DSpace on Nepalese Librarians

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Abstract

In Nepal, the use of DSpace is increasing for building digital institutional repositories; however, its usability for Nepalese librarians was yet to be evaluated. The usability test of DSpace on Nepalese librarians assisted in evaluating DSpace from their perspective and experience. This study aimed to assess the usability of DSpace on them, examine usability factors, and identify required intervention on DSpace and the skill of Nepalese librarians to increase usability of DSpace. The study also identified the impact of training on the usability of DSpace. The pre-test questionnaire and post-test questionnaire were applied to assess the impact of training. The training on DSpace increased usability significantly (p-value = 0.0001). The task performance usability test on them resulted in effectivity and efficiency of DSpace. However, there was low relation between the number of errors and time consumption during their task performance. The increased usability of DSpace on Nepalese librarians indicated the hopeful sign of increasing digital content from Nepal in coming days.

Keywords: *DSpace, Nepalese librarians, Usability test, Institutional repositories.*

Introduction :

The usability test is the test of users' acceptance of the software and the system (Sasmito & Nishom, 2019). As the factors of usability, usefulness, satisfaction, ease of use, and ease of learning were measured (Jubaedah et al., 2020). The enhanced usability indicated the improved adoption of the system by users. One of the tools applied for enhanced usability was the training about the system. The training was conducted for library staff in Massachusetts Institute of Technology (MIT) when a digital library software DSpace was first implemented (Baudoin & Branschofsky, 2003) because they are responsible for data curator and uploading, though multiple users can be authorized uploading data in DSpace (Devakos, 2006; Kim, 2005).DSpace software is useful for digital full-text data accompanied by bibliographic metadata of the item. Those items are

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institutionally generated information sources that are possible to store and organize in the DSpace platform. Hence, it is called institutional repository-making software. DSpace allows the storage and organizing of full text and is accessed remotely once it has been made accessible on the web (*DSpace direct*, n.d.; Lyrasis, 2021; Rajović et al., 2018; Smith et al., 2003; Tansley et al., 2005).

DSpace, the open-source digital repository-building library software has been gradually popular in Nepalese libraries too (Nyaichyai et al., 2021). Open-source software has publicly available source code that can be copied, modified, and redistributed with the proper attribution. No fee is required to obtain a licence (Fitzgerald et al., 2011). After the development of DSpace in 2002, it was employed in many libraries around the world (Smith et al., 2003), and was reported installed by 3199 organizations from all over the world by the fiscal year 2021/ 2022 (DSpace, 2022). In 2008, Nepalese libraries began using this software (Pradhan, 2016). The more proficient they become, the more successfully librarians manage digital libraries in DSpace. Its usability has been tested to see how well it works for librarians.

The nine DSpace repositories are being maintained by Nepalese libraries. Tribhuvan University Central Library (TUCL) has amassed the most items of any of these repositories, 12,860 (TUCL, 2022; TUCL e-Library, 2022), though this is still a small number. Librarians are users of digital library software. They use the software at the administrative level while creating institutional memory. The usability test on librarians aims to encourage the use of DSpace software and to identify the need for improvement in DSpace. DSpace offers a wide range of functions.

A usability test is carried out while performing the task or filling out the usability questionnaire. It is possible to conduct tests on multiple components of a product (Dumas et al., 1999). A short training and hands-on practise were conducted to encourage Nepalese librarians to use DSpace. However, the majority of Nepalese librarians have little or no experience with DSpace. After the training, the usability of DSpace was tested on those librarians through a usability questionnaire and some of them were observed operating on DSpace.

Since DSpace came into gradual use in Nepal, it is essential to explore how well the DSpace software was used and perceived by Nepalese librarians. If they have a favourable opinion of DSpace and believe it to be highly usable, this will increase DSpace's adoption and help add digital content from Nepalese libraries. There are some studies found testing the usability of DSpace on a particular aspect of it in other countries (Ottaviani, 2006; Scholtz et al., 2016; Shiweda, 2018). Some studies were conducted on installation procedures usability; others were on the usability of document uploading among young students in DSpace (Körber & Suleman, 2008; Luísa Chaves & Muñoz, 2017; Ottaviani, 2006).

The situation for Nepalese librarians is unique, which means that Nepalese librarians have only recently begun to embrace technology. They are, however, struggling to gain deeper technical knowledge. DSpace for Nepalese librarians is not a new concept, but there are some limitations (Nyaichyai et al., 2021). DSpace was installed by technical experts for Nepalese librarians, and they input data. Nepali librarians must complete training and practical experience before they may respond to DSpace usability questions.

Objectives of the study :

Considering the need for an evaluative study of DSpace software operation by Nepalese librarians, the study aimed for usability test. The study's goal is exploring how Nepalese librarians have experienced operating DSpace software for institutional repository. In specific, following objectives were set for this study.

1. To assess the usability of DSpace for institutional repository building.
2. To examine the factors contributing usability of DSpace for Nepalese librarians.
3. To identify the required intervention for Nepali librarians' skills in DSpace operation and greater usability.

Research methods :

The attributes of usability are either measured by questionnaire (Scholtz et al., 2016) or by performance observation (Ternauciuc & Vasiu, 2015). This study has also conducted both methods. The data from both methods were retrieved quantitatively. This study used quantitative research methods. It used moderated experimental tools to collect data. That is, after answering the pre-test questions about the DSpace software, participants completed the structured questionnaire. DSpace functionalities were divided into four categories, and questions about their usability variables were asked for each. For this usability test, the DSpace 6.3 version was examined.

Table 1: List of usability variables and categories of DSpace functionalities that were tested upon

Categories of DSpace functionalities	Usability variables
DSpace introduction	Ease of use (EU)
DSpace configuration and customization	Usefulness (U)
File uploading and data harvesting in DSpace	Effectiveness (EF)
E-person, Groups, and authorization in DSpace	Efficiency (Eff)
	Satisfaction (SA)

There is both use of qualitative and quantitative tools used for testing usability (Alshamari & Mayhew, 2009; Hughes, 1999). Though the observation method is qualitative, the data was retrieved quantitatively.

A statistical technique was used to establish the sample size for this investigation. There are altogether 118 librarians in Nepal who hold a master's degree in library and information science (Nepal Library Association, 2021). Using a 95% confidence level, a 10% margin of error, and a 50% sample percentage, the sample size was 54 librarians. The structured questionnaire about the usefulness of DSpace for the library profession, the data harvesting facility of DSpace, the feasible file format for uploading items in DSpace, the file uploading process, and satisfaction with DSpace was asked of the participants and asked them before and after the training of DSpace. The post-test questionnaire was filled out after the training. The questionnaire was prepared and filled in in the Google form, so they were emailed to the respondents. The pre-test questions were first filled out by the respondents, and they were invited to the online training session for 2 hours, then the same questionnaire was sent to be responded to.

Altogether ten questions were asked and they are kept as statements here. Those statements were categorized into factors of usability that is usefulness (U), ease of use (EU), effectiveness (EF), efficiency (Eff), and satisfaction (SA). All factors were measured with two different statements for each.

In addition to questionnaires, the observation session was conducted for 8 librarians selected among the respondents. They were randomly selected. They were made to sign in to DSpace, build community and collection, upload a file, and made to register e-people in DSpace. Their working screen was recorded using OBS Studio software. They were invited to the computer lab of the Central Department of Library and Information Science, Tribhuvan University. The observation was quantified for the data analysis.

Results :

Only 9.8% of the participants in the study showed the ability to use DSpace. DSpace is not a piece of software that less experienced librarians could use in their line of work. In order to conduct this study, two hours of training and practice were required.

Impact of training on increasing usability value :

The highest post-test score (94.2%) was obtained by the usefulness (U) factor and the lowest post-test score (34.3%) was obtained by the efficiency (Eff) factor. While evaluating these factors for usability as per the ranked categories of excellent (above 80), good (60-80), fair (40-60), poor (20-40), and worst (below 20) was determined usability rank (Table 3). The data revealed that the usefulness of DSpace for the librarians' profession is excellent, while the efficiency of DSpace is poor for them. Questions for efficiency were related to data uploading in DSpace, which has to follow six different forms and metadata were to be filled by the item uploader for the DSpace repository. So, the time consumption for the new practitioner is longer. Based on the responses for

self-understandability for the respondents was lesser than other usability factors. It might depend on the practice of uploading data in DSpace for librarians.

Table 3: Pre-test and post-test scores in percentage for all five factors of usability of usability factors

Usability factors	Related question content	Pre-test score in %	Post-test score in %
U1	DSpace is useful for the library profession	73.2	94.2
U2	Knowledge of data harvesting from others' DSpace repositories using OAI PMH is a useful feature	76.2	91.2
EU1	The Doblin core meta-data scheme is easy to understand and use in DSpace	80	88.5
EU2	Data harvesting is easy to use in DSpace	28.1	58.9
EF1	File format pdf and Docx are more feasible to upload files in DSpace	18.4	34.3
EF2	I can install DSpace with the help of an expert, document, and self	85.4	97.1
Eff1	DSpace takes 5-10 minutes for the file-uploading process	55.1	65.7
Eff2	The description for the file uploading process is self-understandable in DSpace	8.4	22.9
SA1	The most liked usage of DSpace is managing digital content	56.8	85.3
SA2	I am satisfied with the process of file uploading	80.5	91.5

Source: Field survey.

Very few (9.8%) librarians who participated in the usability test stated that they were skilled on DSpace and were accustomed to using it in their line of work. So, this usability test's moderating component is the training. The training proved a significant

contributor to the increased usability of DSpace. Hence, the graph lines presented in figure 1 below has depicted the higher post-test score for each factor in comparison to the pre-test score.

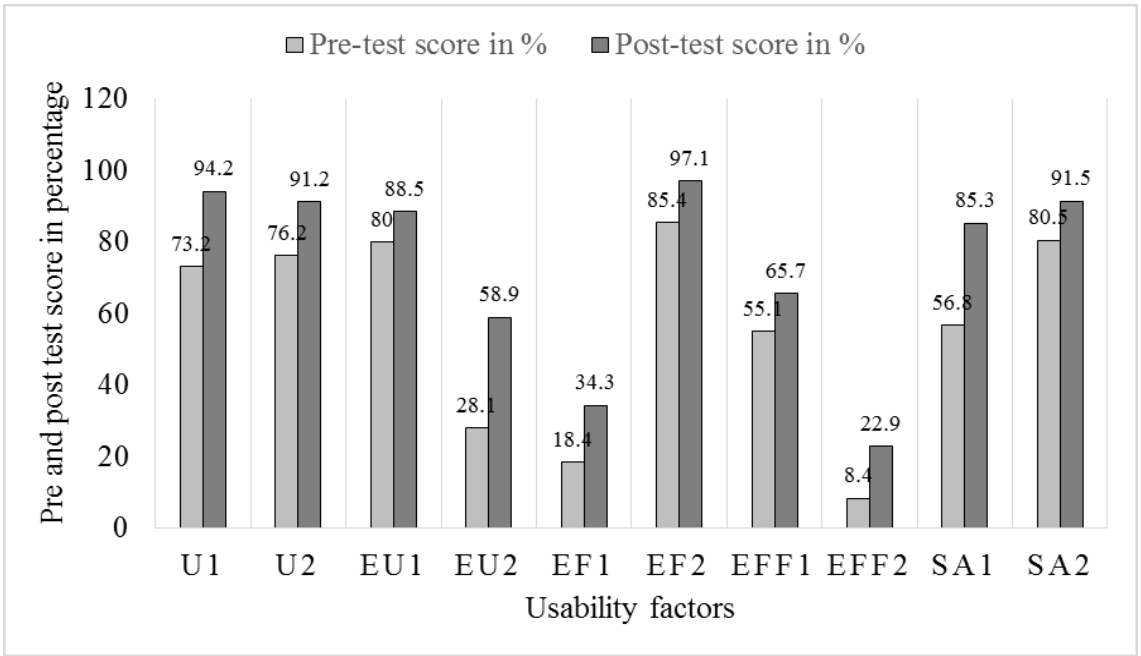

Figure 1: Comparing pre-test and post-test scores for usability factors.

So, it meant the training and the practice afterward did not well impact the factor that was responded lesser in the pre-test. The gained skill on those factors remained less even after the training. However, the t-test for paired two samples generated a statistical value of p=0.0001 in the degree of freedom (d. f.=8). P value is less than 0.05, so, the pre-test score and post-score are highly correlated. The training of DSpace for librarians helped to increase the post-test score of DSpace usability for Nepalese librarians. The contribution of moderating factor, training has significant importance for increasing usability.

While analysing the scores of these factors in mean value, the result suggested that the usability of DSpace in the pre-test was ranked fair, which was changed in participants' responses, and ranked up to good since the average score has increased from 56.21 to 72.96 percent (Table 4):

Table 4: Average score of all usability factors

Usability factors	Pre-test score average	Post-test score average
Usefulness	74.7	92.7

Usability factors	Pre-test score average	Post-test score average
Ease of Use	54.05	73.7
Effectiveness	51.9	65.7
Efficiency	31.75	44.3
Satisfaction	68.65	88.4
Total average	56.21	72.96

Usability test through task performance :

In addition to questionnaire responses, the usability of DSpace was conducted through task performance too. Usability is concerned more with objective results during the task performance in DSpace. So, 8 participants were observed performing 5 tasks in DSpace, which was screen recorded.

Five tasks were performed by the participants. Their performance proved that DSpace is fully effective because they completed all the given tasks with success. 50% of the participants made no mistakes, while the other 50% reached the wrong page for the lowest 1 time and highest 6 times. The frequency of error in each task and the consumed time were shown in table 5. The correction between frequency of error and average time consuming resulted in low relation. The smaller number of mistakes showed the effectiveness of the DSpace, and less searching time denoted the efficiency of DSpace. For two functions filling metadata and uploading documents, and harvesting data from other DSpace repositories consumed the longest time (8.375 min) in comparison to other tasks (Table 5). As in the questionnaire response, the efficiency score related to metadata filling and uploading data was less scored, which was compatible with the task performance as well. The task of uploading data has a long process to remember and much information to understand. Similarly, harvesting data also require writing request verb in the DSpace repository and has to identify the batch number of the bundles of items. Due to these special and accurate commands, it needs attention. Hence, it took a long time.

Table 5: Result of task performance in DSpace

Task	Frequency of error	Average time in minute
Making Community	1	4.25
Making collection	6	5.75
Filling metadata and uploading document	0	8.37

Task	Frequency of error	Average time in minute
Making e-people	1	1.62
Harvesting Data from MIT Dspace repository	6	8.37

Correlation = Low relation **Source: Field Survey**

Discussions:

The objective of this study was to assess usability of DSpace, to examine the factors of usability, and to identify the required intervention for Nepalese librarians for increasing usability. Through questionnaire and task performance method, the usability was found fair and good on Nepalese librarians. The intervention made was training given to participants, which increased from 9.8% to 55.6%. Due to the training the usability increased from 56.21% to 72.96%. The increased usability is yet ranked good, but it is not excellent. The poor usability factors were found EF1(18.4% & 34.8%) and Eff2 (8.4% & 22.9%) during pre-test and post-test results. EF1 is about the file format, and Eff2 is about file uploading process understandability. Both are related file uploading elements. File uploading is one of the most regular tasks for Librarians, the clarity about it is vital for the whole system. However, during the task performance, participants made no errors for file uploading process. Once hands-on practice was made, the confusion had been removed on participants (Wu et al., 2014). The average time consumption was 5.67 minutes for participants, which is nominal time for new practitioners.

Library software implementation demands many preparatory actions and information technology too. Many Nepalese librarians do not get such infrastructure available in their libraries. On top of that, the installation of DSpace requires higher computer knowledge, which the MLISc course did not cover. So, without the help of a technician, they could not get a chance to operate it. Due to this background context, Nepalese librarians were made to participate in the training program even for a short period. The training intervention contributed to the increasing score for usability factors too. Its impact was statistically proven with the t-test value p=0.001, showing the higher impact of training on increasing the usability of DSpace. Other studies have also prescribed the need for training for the usability of interoperability of DSpace (Masinde & Sanya, 2022). After the training, the overall usability has increased significantly, however efficiency of using DSpace needs extra effort for Nepalese librarians. During the task performance, the correction between frequency of error and average time consuming resulted in low relation. Time consumption was not affected much by the errors made. It is a good sign for achieving better efficiency in DSpace.

Conclusions :

This sort of usability study has revealed the need of training as the intervention for greater usability. Through this study, the data uploading process required more attention. The customization for the data uploading process, like tailoring only basic metadata filling forms are required so that it could take a shorter time for librarians. The use of interoperability among DSpace repositories is more liked by librarians (76.2% and 91.2%) but they expressed the need for a precise process to obtain the results. Interoperability facility of DSpace is one of the reasons for being most liked by Nepalese librarians, hence, stated satisfied (80.5% and 91.5%). Yet, it is still an uncovered question that how many Nepalese institutional repositories are built for interoperable. It could be a future study.

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Appendix:

Table 2: Description of usability factors represented in the questionnaire

Factors of Usability	Items	Measures
Usefulness (U)	U1	DSpace is useful for the library profession
	U2	Knowledge of data harvesting from others' DSpace repositories using OAI PMH is a useful feature
Ease of use (EU)	EU1	The Doblin core meta-data scheme is easy to understand and use in DSpace
	EU2	Data harvesting is easy to use in DSpace
Effective (EF1)	EF1	File format pdf and Docx are more feasible to upload files in DSpace
	EF2	I can install DSpace with the help of an expert, document, and self
Efficient (Eff)	Eff1	DSpace takes 5-10 minutes for the file-uploading process

Factors of Usability	Items	Measures
	Eff2	The description for the file uploading process is self-understandable in DSpace
Satisfaction (SA)	SA1	The most liked usage of DSpace is managing digital content
	SA2	I am satisfied with the process of file uploading

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