Evaluation of Usability on Dataverse in Repositori Ilmiah Nasional (RIN) at the Indonesian Institute of Sciences

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Abstract—Repositori Ilmiah Nasional/RIN (The National Scientific Repository) is a means to share, preserve, explore and analyze research data, developed by the Center for Scientific Data and Documentation-Indonesian Institute of Sciences (PDDI-LIPI). This study aimed to evaluate RIN at LIPI by using *Usability* with *heuristic evaluation*. The method used was descriptive with a quantitative approach. The technique of collecting data used a questionnaire as a research instrument; the population of this study was researchers at the LIPI. Determination of the sample was taken using the Solvin formula, obtained a sample of 17 respondents. The results showed that there were 7 (seven) variables that were in the Agree category including Visibility Status, Match Between System and The Real World, User Control and Freedom, Consistency and Standards, Prevention Error System, Recognition Rather Than Recall, Aesthetic Design. Then 2 (two) in the category of Strongly Agree including Flexibility and Efficiency of Use, and Help and Documentation. Finally, there was one variable that fell into the Neutral category, Recovery and System. The usability level of RIN LIPI dataverse website was 75.44% which was in the Agree/High category.

Keywords—usability, dataverse, Repositori Ilmiah Nasional (RIN), PDDI-LIPI, evaluation

I. INTRODUCTION

Repositori Ilmiah Nasional/RIN (The National Scientific Repository) is a primary data management system and scientific work based on open source, dataverse. The RIN system is the result of developing a dataverse system developed by Harvard University to facilitate researchers in storing research data. The RIN is developed based on the Researcher's need to store, preserve, and share research data. During this time, primary research data, such as Researcher's scribbles/notes, results of field data and interview data with resource persons, as well as observations, have been poorly managed, making them difficult to find again [1].

The availability of scientific works and primary data, in the long run, requires a system and regulation regarding the repository of scientific works and primary data depository. During this time, following Minister of Research and Technology Decree No. 44/M/Kp/VII/2000 on Submission of Grey Literature relating to science and technology, Center for Scientific Data and Documentation-*LIPI* (PDDI-LIPI/formerly PDII-LIPI) is one of the repositories of grey literature documents to be informed to the public at large.

In the Decree of the State Minister for Research and Technology number: 44/M/Kp/VII/2000 concerning Submission of Grey Literature related to Science and Technology, in the second letter it was stated that a copy of the grey literature must be submitted in 3 (three) copies, provided that 1 (one) copy will be used as material for analysis in policymaking at the Office of the State Minister for Research and Technology and 2 (two) copies will be submitted to the Center for Scientific Information and Documentation-Indonesian Institute of Sciences to be documented and informed to the wider community [2].

Joachim Schopfel mentioned that Grey literature was often described as unpublished material disseminated outside commercial channels, not peer-reviewed and with limited information referencing [3].

In the Head of Indonesian Institute of Sciences (LIPI) Regulation number 12 year 2016 concerning Repositories and Deposits of the Indonesian Institute of Sciences in the consideration section states that: a. that scientific work and primary data resulting from research and/or development, surveys, or systematic thinking within the Indonesian Institute of Sciences are important assets in improving the quality of research within the Indonesian Institute of Sciences so that they must be available for the long term; b. That to guarantee the availability of scientific work and primary data as referred to in letter a for the long term, it is necessary to establish a

mechanism for the repository of scientific works and primary data depository within the Indonesian Institute of Sciences [4].

II. REVIEW LITERATURE

Abhilasha Priyadarshani mentioned that institutional repository as a service that allows preservation and dissemination of scientific output from an institution. Repository items were born digital or digital, marked with metadata to describe the subject, ownership, copyright, and structure; indexed; organized into collections and can be searched via the web; and maintained for long-term access. Institutional repositories were inherently linked to open access movement. The most part, institutional repositories have collections of research publications, theses, dissertations, annual reports and institutional publications. Previously, institutional repositories restricted access to their collections to staff, researchers, and users of the parent organization. Institutional repositories enhance teaching, learning, research, and are considered a gift to the scientific community. Institutional repositories have great potential to increase the visibility and impact of institutional research [5].

Petra Černohlávková and Hana Vyčítalová [6] said that contributions highlight the difference between collecting grey literature at the institutional level and at the national (or international) level. The main difference was that institutional repositories usually provide access to and preservation of institutional publications, while aggregators collect results from various sources such as databases, repositories, digital libraries, or web pages. Institutional repositories normally collect institutional publishing activities and internal documents such as directives or business travel reports. Based on their experience, they defined the seven most important topics that require discussion when building a new repository - general conception, document type, collection methods, participation, legal issues, functions, and access. The topic was discussed briefly in the remaining contributions.

There were many types of documents that could be collected by any repository. Initially, it was necessary to analyze or map which types of documents are published in the institution and what format. Regarding format, it was important to verify which ones were suitable for long-term preservation, and which ones were more suitable for access to end-users. Each repository should be flexible enough to deal with the addition of other types of documents than specified at the beginning and meet the needs of the institution [6].

Meanwhile, Shiyan Ou said that curation of data as activities that collect, annotate, organize and preserve digital scientific data for current or future use [7].

Uttam Kumar Hazra said online learning repository was one of the digital reference source methods for learning resources [8]. Tomas A. Lipinski and Katie Chamberlain Kritikos said that access and use of large literature in several places are often carried out through OA policy. However, there were gaps in the literature regarding best practices for the preparation and implementation of Open Access policies that promote unlimited access to grey literature [9].

Prachi Shukla and Naved Ahmad said that scientific information was increasing, constantly changing and progressing over time. It became obsolete soon after it was replaced by new findings and developments. Scientists and research scientists are constantly looking for new publishing media to convey and disseminate their research findings to a global audience before they become redundant. Until recently scientists and research scientists have accepted the publication of commercial journals as the primary means of communicating the results of their research, but the emerging open access movement has revolutionized the whole process of scientific communication [10].

Israel Malweta Nunda and Emmanuel Frank Elia said that institutional repositories helped open grey literature, such as unpublished research reports, theses and dissertations, seminar papers and conferences. Repositories were increasingly becoming podiums for publishing original content and peer-reviewed in an open-access environment. Repositories were used for the acquisition, preservation and dissemination of locally generated scientific information [11].

W. M. Tharanga D. Ranasinghe and Chung Jun Min said that the study concludes that, by functioning as a scientific publishing platform, institutional repositories enable institutions to control the results of their research while promoting accessibility to institutional research in an open-access environment [12].

George Machovec said that academic libraries often host scientific output from their institutions in institutional repositories (IR) and make special digital collections and research data set available online. Public libraries may have local history materials available online such as digital oral history, newspapers, and photographs [13].

Ebenezer Martin-Yeboah, Anankyela Anaba Alemna, Emmanuel Adjei said that academic institutions have sought ways to realign scientific communication, and institutional repositories seem to be a new platform for disseminating intellectual productivity because of the inherent benefits they have. Because of the strategic position occupied by libraries in supporting the teaching, learning and research mandates of academic institutions, they tend to be very instrumental in the development and operation of repositories. Ebenezer Martin-Yeboah, Anankyela Anaba Alemna, Emmanuel Adjei said as a result, the ongoing development of the repository implies a completely new approach in the campus community regarding why others fail and how to prevent this failure. IR growth was largely concentrated in institutions in developed countries. This was not by standing, there seemed to be a growing awareness and use of IR because the technology was dripping down rapidly from developed countries to developing countries, coupled with a decrease in the cost of electronic gadgets that allow the internet. IR growth was largely concentrated in institutions in developed countries [14].

As an institution for managing scientific, non-scientific data, information and documentation, the Center for Scientific Data and Documentation - Indonesian Institute of Sciences (PDDI LIPI) has the task of carrying out scientific and non-scientific data, information, and documentation management.

In connection with the description above, this study aims to determine the use of RIN by researchers at the Indonesian Institute of Sciences. To facilitate the analysis of the data provided, the question groups are divided into five groups, namely: Visibility Status, Match Between System and The Real World, User Control and Freedom, Consistency and Standard, Prevention Error System, Recognition Rather Than Recall, Flexibility and Efficiency of Use, Aesthetic Design, Recovery and System, and Help and Documentation. The previous research describe in table 1.

TABLE I.   PREVIOUS RESEARCH

Previous research	Formulation of the problem
Usability analysis on the *Undiksha* website using the heuristic evaluation method	The *Undiksha* website had never experienced a change in the interface and the information provided was still incomplete. There was some information needed by students not available on the website.
Analysis of district website information system usability Karanganyar by using Heuristic evaluation Analysis of the district website information system usability Karanganyar by using Heuristic evaluation	The *Karanganyar* district website had never been evaluated.
Analysis of management information system usability receipt of deposit collections at the Library National based approach heuristic evaluation	SIM receipt of the National Library deposit collection still could not detect *double registers*, views that were considered unattractive, the number of menus the number of pages that should be skipped when going to the desired page and the resulting information was not following what was needed and the need for *Backward Requirement Analysis.*

III. METHODOLOGY

The main goal of usability studies in education is to make educational softwares more student-friendly with the aim of easing the cognitive burden that may arise from the design of the material, thus increasing the efficiency and efficiency of the educational environments through increased focus on the content. Today, a number of innovations are introduced to improve the effectiveness and efficiency of digital learning environments. Blending of new technologies and approaches in the design of user-centered learning environments is gaining importance. A number of new technologies are on the ground to provide a richer learning experience for students. They include distance learning technologies for time and spaceindependent learning, digital game-based teaching to ensure lasting and effective learning, individualized teaching to

provide customized training, adaptive teaching, and intelligent tutoring system [15].

The main purpose of usability studies in education is to make educational software more student-friendly to alleviate the cognitive burden that might arise from material design, thereby increasing the efficiency and efficiency of the educational environment through increasing focus on content. At present, some innovations are introduced to increase the effectiveness and efficiency of the digital learning environment. Integrating new technologies and approaches in the design of user-centred learning environments is becoming increasingly important. Some new technologies are present to provide richer learning experiences for students. They include distance learning technology for time and space-dependent learning, digital game-based teaching to ensure lasting and effective learning, individualized teaching to provide customized training, adaptive teaching, and intelligent tutoring systems.

A. Types of Research

This type of research was survey research while the method was descriptive-analytical. Descriptive survey method seeks to explain or record conditions or attitudes to explain what was currently [16]. Descriptive survey method is a research method that takes samples from a population and uses questionnaires as a data collection tool. So in this study, a descriptive analysis will be conducted to measure the level of usability on the website, using the *heuristic evaluation* method.

B. Research Location

The research location was the place where the research will be conducted. This research was conducted at the Indonesian Institute of Sciences (LIPI) which included state civil apparatus (ASN). The time of this research was Juni 2019.

C. Research Procedure

Research Procedure was the steps taken in conducting research, to obtain information that could answer research questions. The research procedure was carried out to be able to reveal completely related to the problems raised in the study. The procedures in this study [17] were as follows.

- Identifying significant problems to be solved through descriptive methods.

- Formulate and limit the problem.

- Determine the research objectives and benefits.

- Conducting literature studies related to the problem.

- Designing the research method to be used including in this case was determining populations, samples, sampling techniques, data collection techniques, research instruments and data analysis.

- Retrieval of data by distributing questionnaires to the study sample. Questionnaires were distributed to sample members to obtain research data.

- Analyze data. The results of the questionnaire in this study were analyzed quantitatively and then described qualitatively.

D. Data Analysis Technique

The qualitative analysis aimed to use the heuristic evaluation method. From the calculation of the percentage, the scale was used as a guideline for describing the usability of the RIN system. After obtaining the percentage of respondents' answers then given an interpretation or assessment of the results of the study. Researchers used the interpretation method [18] as the following table 2:

TABLE II.   RATING CATEGORY

No.	Percentage Interval Limits	Rating Category
1	0-20%	Strongly Disagree
2	21-40%	Disagree
3	41-60%	Neutral
4	61-80%	Agree
5	81-100%	Strongly agree

From these results could be formulated in the form of a percentage so that it could be seen the amount of suitability between the value of agree, strongly agree, disagree and strongly disagree. For the percentage, the formula could be seen in equation [19].

$$Percentage\ (\%) = f/N \ x\ 100\%$$

Notes:
F = Number of Respondents Approval
N = Number of All Respondents

IV. RESULTS AND DISCUSSION

A. General Description

Respondents in this study were *LIPI* employees and practical work students who produced primary research data. The number of respondents studied was 17 people. *LIPI* employee respondents consisted of functional researchers, librarians, engineers, computer staff, and so on.

B. Discussion

1) Visibility status: Based on the results of an analysis of 17 respondents accessing RIN data in terms of the System Status Visibility variable can be seen in Table 3.

TABLE III.   VISIBILITY STATUS

	Variable Visibility			
	Suitability of System Title	*Consistency*	*Clarity of Menu*	*Response time*
Respondents	75%	75%	81,25%	81,25%

From the tabulation of 4 indicators on the Visibility variable, the average percentage obtained for respondents was 78.12%, which fell into the Agree category.

2) Match between system and the real world: Based on the analysis of 17 respondents who accessed the RIN data in terms of the Match Between System and The Real World variables can be seen in Table 4.

TABLE IV.   MATCH BETWEEN SYSTEM AND THE REAL WORLD

	Variable Match Between System and The Real World			
	Use of Grammar	*Use of Media Icons*	*Colour Selection*	*Menu Placement*
Respondents	75%	68,75%	81,25%	68,75%

From the tabulation of 4 indicators on the Match Between System and The Real World variables, the average percentage obtained for respondents was 73.43%, which falls into the Agree category.

3) User control and freedom: Based on the results of an analysis of 17 respondents accessing RIN data in terms of User Control and Freedom variables can be seen in Table 5.

TABLE V.   VARIABLE USER CONTROL AND FREEDOM

	Variable User Control and Freedom			
	Ease of Navigation	*Can copy (copyable)*	*Operation Cancellation*	*Undo button*
Respondents	93,75%	62,5%	62,5%	37,5%

From the tabulation of 4 indicators on the User Control and Freedom variable, the average percentage obtained for respondents was 64.02%, which fell into the Agree category.

4) Consistency and standard: Based on the results of an analysis of 17 respondents accessing RIN data in terms of the Consistency and Standard variables seen in Table 6.

TABLE VI.   VARIABLE CONSISTENCY AND STANDARD

	Variable Consistency and Standard			
	Title Consistency	*Menu structure consistency*	*Consistency of Media Use Icons*	*Message Consistency*
Respondents	93,75%	87,5%	62,5%	43,75%

From the tabulation of 4 indicators on the User Control and Freedom variable, the average percentage obtained for respondents was 71.87%, which fell into the Agree category.

5) Prevention error system: Based on the results of an analysis of 17 respondents accessing RIN data in terms of the Prevention Error System variable seen in Table 7.

TABLE VII.   PREVENTION ERROR SYSTEM

	Prevention Error System			
	Use of Sound	*Use of Grammar*	*Cause of Problem*	*The Right Sentence*
Respondents	62,5%	68,75%	75%	62,5%

From the tabulation of 4 indicators on the variable Prevention Error System, the average percentage obtained for respondents was 67.18%, which fell into the Agree category.

6) Recognition Rather Than Recall: Based on the analysis of 17 respondents accessing RIN data in terms of the variable Recognition Rather Than Recall seen in Table 8.

TABLE VIII.   RECOGNITION RATHER THAN RECALL

	Recognition Rather Than Recall			
	The angle of Information Display	*Clarity of Message Position*	*Category area*	*Item Color Change*
Respondents	81,25%	75%	93,75%	81,25%

From the tabulation of 4 indicators on the variable Recognition Rather Than Recall, the average percentage obtained for respondents was 82.81%, which fell into the category of Strongly Agree.

7) Flexibility and efficiency of use: Based on the analysis of 17 respondents who accessed the RIN data in terms of the variable Flexibility and Efficiency of Use, see Table 9.

TABLE IX.   FLEXIBILITY AND EFFICIENCY OF USE

	Flexibility and Efficiency of Use	
	Specific Keywords To Shorten Search	*Sort and Filter Search*
Respondents	93,75%	87,5%

From the tabulation of 2 indicators on the variable Flexibility and Efficiency of Use, the average percentage obtained for respondents was 90.62%, which fell into the category of Strongly Agree.

8) Aesthetic design: Based on the analysis of 17 respondents accessing RIN data in terms of the Aesthetic Design variable seen in Table 10.

TABLE X.   AESTHETIC DESIGN

	Aesthetic Design		
	Interactive Design	*Colour Selection and Font Size*	*Page, Icon and Object Settings*
Respondents	75%	87,5%	75%

From the tabulation of 3 indicators on the variable Aesthetic Design, the average percentage obtained for respondents amounted to 79.16%, which fell into the Agree category.

9) Recovery and syste: Based on the analysis of 17 respondents accessing RIN data in terms of Recovery and System variables, see Table 11.

TABLE XI.   RECOVERY AND SYSTEM

	Recovery and System	
	Notification Warning When There Is an Error	*Give advice*
Respondents	50%	56,25%

From the tabulation of 2 indicators on the Recovery and System variable, the average percentage obtained for respondents was 53.12%, which fell into the Neutral category.

10) Help and documentation: Based on the analysis of 17 respondents who accessed the RIN data in terms of the Help and Documentation variable seen in Table 12.

TABLE XII.   HELP AND DOCUMENTATION

	Help and Documentation		
	"Contact Us" menu to guide	*"Contact Us" is easily accessible*	*Easily Move From "Contact Us" to Search*
Respondents	94,11%	94,11%	94,11%

From the tabulation of 2 indicators on the Help and Documentation variable, the average percentage obtained for respondents was 94.11%, which fell into the category of Strongly Agree.

According to the results of research conducted, there were 7 (seven) variables that fall into the Agree category including Visibility Status, Match Between System and The Real World, User Control and Freedom, Consistency and Standards, Prevention Error System, Recognition Rather Than Recall, Aesthetic Design.

Then 2 (two) in the category of Strongly Agree including Flexibility and Efficiency of Use, and Help and Documentation. Finally, there is one variable that falls into the Neutral category, Recovery and System.

The highest percentage of variables was the Help and Documentation variable. Then the lowest was the Recovery and System variable because there were still many respondents who stated Neutral on the function.

V.   CONCLUSION AND FUTURE SCOPE

The conclusion of the research was, determining respondents using the Slovin formula so that a sample of 17 respondents from all functionalities in LIPI was obtained. There were 10 variables used in this study taken from the usability method, which was the heuristic evaluation method. The results of the level of usability on each variable, then the results of the calculation of 10 variables heuristic evaluation method to obtain the usability level of dataverse website RIN LIPI that was equal to 75.44% included in the Agree or High category.

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