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USER REQUIREMENT FOR WEB-BASED PROCEEDINGS REPOSITORY

[1]Norsyahira Shamilla Che Mohd Sakri & [2]Wan Hussain Wan Ishak
[1&2]Universiti Utara Malaysia, Malaysia

[2]Corresponding author: hussain@uum.edu.my

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ABSTRACT

Conference is a popular platform for academics to exchange knowledge and engage with one another. The conferences typically produce collections of papers, known as conference proceedings, which are often published online as open-access resources to facilitate more comprehensive access and dissemination of knowledge. Consequently, there has been a significant increase in articles on online conference proceedings. However, the absence of an organised management system has made it increasingly challenging for users to locate and retrieve specific proceedings. To address this issue, this study proposes implementing a digital repository system to simplify the sharing and distributing of conference proceedings articles. The primary goal of this project is to provide a sustainable solution for storing and accessing conference proceedings, characterised by its reliability, efficiency, effectiveness, and user-friendliness. Such an enhancement is anticipated to boost research productivity and quality. In this article, we present the system requirements for the repository. Subsequently, based on these requirements, we have developed a prototype called the Web-based Digital Repository for Proceedings Articles (WDR). We conducted a field study to assess the prototype's usability, and the evaluation results indicate that WDR is both practical and user-friendly.

Keywords: Digital repository, Digital archive, Information storage, Data management, Content repository

INTRODUCTION

Conferences are crucial gatherings for professionals, researchers, and experts to exchange knowledge and foster innovation across various fields. Academic conferences, in particular, play a pivotal role in scholarly communication, allowing researchers to present their work, receive feedback, and publish their findings (Lopez de Leon & McQuillin, 2020). Similarly, conferences in industries like technology, healthcare, and finance drive discussions that shape the future of these sectors.

The formal output of these events, known as conference proceedings, is instrumental in preserving knowledge and extending the impact of a conference. These proceedings act as repositories for research findings and insights, ensuring accessibility and the enduring relevance of the contributions made during the event. For academics, conference proceedings often serve as precursors to formal journal publication and are crucial references in their research. Within academic circles, citing conference proceedings is not just a scholarly convention; it is a way to acknowledge the sources of information, foster scholarly dialogue, and preserve intellectual lineage. As time passes, these documents evolve into historical records, offering valuable insights into the progression of ideas and trends within specific fields (Lui, 2004).

Despite the growing number of conference proceedings, their management lacks systematic organisation, leading to inconsistencies in publication approaches (Wang et al., 2023). These proceedings are often presented statically, without a dedicated database or search functionality, which poses significant challenges for users seeking valuable articles. To address these issues, this study proposes creating a web-based digital repository to streamline the upload, storage, and retrieval of conference proceedings articles. This repository aims to provide a comprehensive solution for managing these papers while offering technical insights and serving as a reference point for developers.

DIGITAL REPOSITORY

A digital repository serves as a dedicated system or platform designed to comprehensively collect, store, manage, and preserve a wide range of digital assets and content types, spanning documents, images, videos, research papers, datasets, and various forms of digital media (Jamaluddin & Ishak, 2011; Denison, 2007). The core mission of a digital repository is to ensure long-term access to these digital materials, facilitating their discoverability and accessibility for users (Butterfield et al., 2022). Digital repositories find utility across diverse contexts, including archiving academic and research materials, preserving cultural heritage, storing data from scientific experiments, and more. Their intrinsic value lies in their ability to effectively organise and safeguard digital information, ensuring its availability for current and future generations.

A web-based digital repository represents a specialised category within this digital repository landscape (Sakri & Ishak, 2023). Distinguished by its accessibility and management through web-based technologies and the internet, these repositories empower users to access their content through web browsers conveniently, rendering them widely accessible and user-friendly. Web-based digital repositories often incorporate intuitive interfaces, allowing users to seamlessly search, browse, and retrieve digital assets online. Institutions such as academic organisations, libraries, museums, and research institutions commonly leverage web-based digital repositories to extend the reach of their digital collections to a global audience. A web-based digital repository that houses digital articles or publications offers many advantages (Dijk & Moti, 2023; Lappalainen & Narayanan, 2023). Firstly,

it significantly enhances the accessibility of these articles by making them readily available online. This accessibility enables researchers, scholars, and students to access conference proceedings articles from any location with an internet connection, thereby promoting the broader dissemination of knowledge. Moreover, web-based repositories frequently feature advanced search and retrieval functionalities, streamlining the locating of specific articles. This efficiency saves valuable time and effort for researchers seeking relevant content. Additionally, these repositories centralise the storage of conference proceeding articles, simplifying the management and organisation of substantial volumes of content. Centralised storage mitigates duplication and ensures consistency in archiving practices, enhancing overall efficiency (Ghedi et al., 2016).

Web-based repositories also facilitate proper citation and referencing of conference proceeding articles, enhancing research credibility and academic rigour. Furthermore, researchers can collaborate more effectively as they access and share these articles with colleagues and peers globally, fostering a sense of community within the academic and research community. They also provide valuable analytics and usage data, enabling publishers and institutions to monitor the popularity and impact of specific articles. As substantiated by numerous studies (Lappalainen & Narayanan, 2023; Gibbons, 2009; Tansley et al., 2003; Mgonzo & Yonah, 2014), standard features of a web-based digital repository designed for housing conference proceeding articles typically encompass online access, efficient search tools, document viewing, detailed metadata, user-friendly navigation, advanced search filters, version control, preservation strategies, customisation options, usage analytics, DOI integration for citable links, robust security measures, user authentication for access control, content submission interfaces, notification systems, and support for open access publishing models. Web-based digital repositories are pivotal tools for efficiently managing and making conference proceedings articles accessible. They address the challenges of organising and accessing these critical components of scholarly communication and knowledge dissemination. These repositories are crucial in advancing research, enhancing collaboration, and preserving the intellectual heritage of various fields and industries.

METHODOLOGY

The research design adopted for this study employs an exploratory approach. The primary aim of this approach is to thoroughly investigate the feasibility and requisite conditions for establishing a web-based digital repository exclusively dedicated to housing conference proceedings articles. This methodological choice facilitates a comprehensive examination of the subject matter, offering invaluable insights into the multifaceted challenges and opportunities inherent in developing and maintaining such a repository (Swaraj, 2019).

The initial phase of this study entails the systematic collection of data through an exhaustive review of extant literature. This literature review encompasses various sources, including digital, institutional, and web-based repositories. Its principal objective is to elicit discerning insights into prevailing best practices, defining characteristics, and core functionalities pertinent to repositories of this nature. Subsequently, the amassed data is subjected to rigorous analysis, resulting in the synthesis of pivotal findings. These findings, in turn, serve as the foundational bedrock upon which the essential attributes and advantages of digital repositories are predicated. The repository design and development phase is underpinned by a methodical approach that harnesses the visualisation capabilities of Unified Modelling Language (UML) to meticulously plan the system architecture, user interfaces, and interaction flows. This UML-based design ensures a user-centric, intuitive, and efficient web-based

digital repository. Concurrently, PHP is the primary programming language, capitalising on its versatility in web application development. At the same time, MySQL serves as the relational database management system (RDBMS), ensuring efficient storage and retrieval of conference proceedings articles, metadata, and user information. This strategic combination of UML, PHP, and MySQL expedites the translation of design concepts into functional components. It establishes a robust, user-friendly foundation aligning with the repository's objectives and user requirements.

DESIGN AND DEVELOPMENT OF WDR

This section delves into designing and developing a web-based digital repository for conference proceedings articles. A two-step process is employed in the requirement-gathering phase to comprehend the requirements for this development. The first step involves comprehensively analysing documents and information from internet resources. Relevant content is meticulously sourced using targeted keywords such as "digital repository," "proceedings articles repository," "proceedings articles," and "web-based digital repository for proceedings articles." The gathered information is subject to thorough analysis and documentation, forming the foundation for constructing the requirements for developing the web-based digital repository for proceedings articles. Table 1 enumerates the specifications of the system's requirements. These requirements are categorised into three primary segments: 'Configure,' 'Register,' and 'Authenticate.' Each requirement is assigned a priority level indicated by M (Mandatory), O (Optional), or D (Desirable).

Table 1
The List of Requirements

No.	Requirement Description	Priority
WDR_01	**Registration**	
WDR_01_01	The system must allow the organiser to register.	M
WDR_02	**Login / Logout**	
WDR_02_01	The system must allow the admin and the organiser to log in and out.	D
WDR_02_02	**Login**	
WDR_02_02_01	The system must allow the user to log in based on the role, which is admin or organiser.	M
WDR_02_02_02	The system must display a page where the admin and the organiser can enter their login information, such as username and password.	M
WDR_02_02_03	The system must verify the username and password of the user.	M
WDR_02_02_04	If the user forgets their password, the system must allow them to retrieve it by entering their email and username.	D
WDR_02_03	**Logout**	
WDR_02_03_01	The system must allow the user to log out.	M
WDR_03	**Manage Organizer Account**	
WDR_03_01	The organiser and admin should be able to view and edit the account information. Meanwhile, only the admin can approve or reject new organiser requests and view the list of organisers.	D
WDR_03_02	**Approve/reject request**	M
WDR_03_02_01	The system should allow the admin to approve or reject new organiser registration requests.	

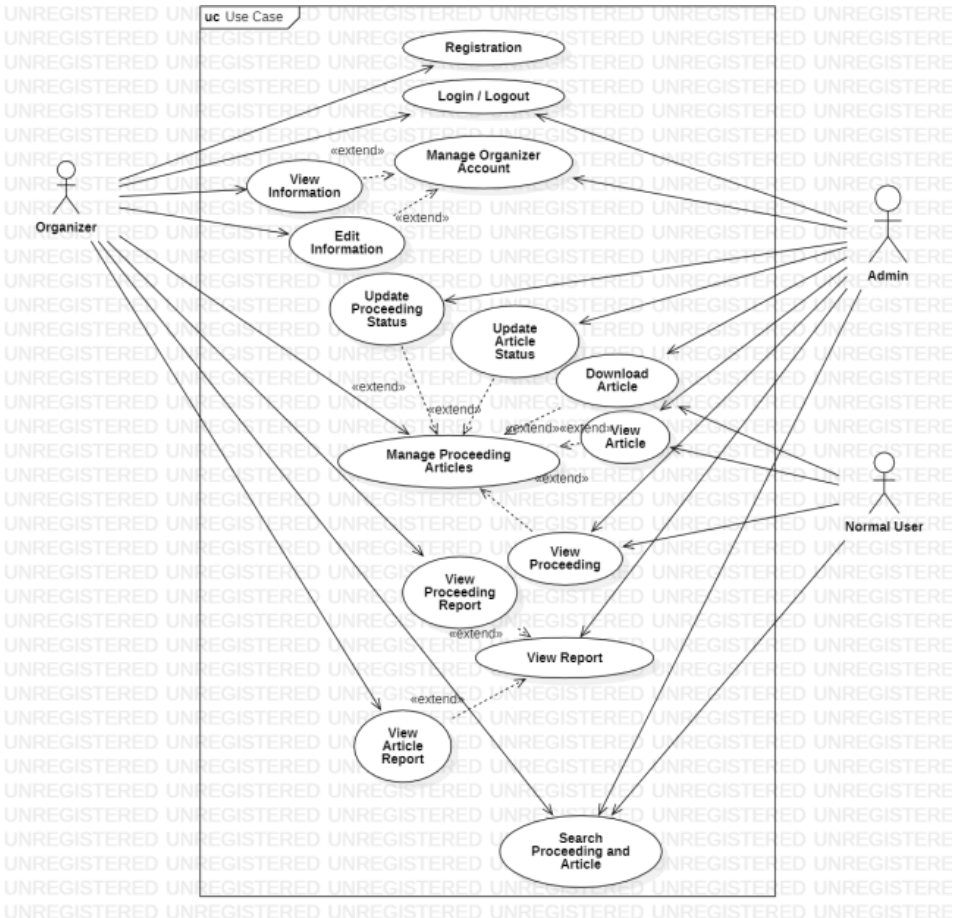
WDR_03_03	**View list of organisers**	M
WDR_03_03_01	The system should allow the admin to view the list of organisers.	
WDR_03_04	**View Information**	
WDR_03_04_01	The organiser's username, name, address, phone number, email, URL, and person in charge must all be viewable and retrievable for the organiser and admin. Meanwhile, only the organiser can view the password.	M
WDR_03_05	**Edit Information**	
WDR_03_05_01	The system must allow the organiser and admin to edit the organiser's name, address, phone number, email, URL, and person in charge. Meanwhile, only the organiser can edit the username and password.	M
WDR_03_05_02	The system must save all edited information.	O
WDR_04	**Manage Proceeding Articles**	
WDR_04_01	The organiser can add, view, edit, delete, and update the proceeding status, add, edit, view, delete, update status, and download the articles. Meanwhile, the admin can view and update the status of the proceeding, view the article, update the article's status, and download the article. The normal user can view proceedings, view articles, and download articles.	D
WDR_04_02	**Add Proceeding**	
WDR_04_02_01	The system must allow the organiser to add proceedings, including the conference's name, date, venue, URL, proceeding name, editor, year, month, volume, issue, ISBN/ISSN, publisher, and published information.	M
WDR_04_02_02	The system must save all new information.	O
WDR_04_03	**Delete Proceeding**	
WDR_04_03_01	The system must allow the organiser to delete the proceeding information.	M
WDR_04_03_02	The system must delete the articles permanently from the system.	O
WDR_04_04	**Update Proceeding Status**	
WDR_04_04_01	The system should allow the admin and organiser to update the status of proceedings by turning them on or off for regular users.	M
WDR_04_05	**View Proceeding**	
WDR_04_05_01	The system must be able to list the proceedings.	M
WDR_04_05_02	The system must allow the admin, organiser, and normal user to view the proceeding, including the proceeding information.	M
WDR_04_06	**Edit Proceeding**	
WDR_04_06_01	The system must allow the organiser to edit the conference's name, date, venue, URL, proceeding name, editor, year, month, volume, issue, ISBN/ISSN, publisher, and published information.	M
WDR_04_07	**Add Article**	
WDR_04_07_01	The system must allow the organiser to add a new article.	M
WDR_04_08	**View Article**	
WDR_04_08_01	The system should allow the admin, the organiser, and the normal user to view the article and its information.	M
WDR_04_08_02	The system must be able to list the articles based on the proceedings.	M

WDR_04_08_03	The system should be able to track how many times the average user has viewed the article.	M
WDR_04_09	**Edit Article**	
WDR_04_09_01	The system must allow the organiser to edit the title, author, abstract, keywords, and page number of the articles.	M
WDR_04_10	**Delete Article**	
WDR_04_10_01	The system must display an option for the organiser to delete the articles.	M
WDR_04_10_02	The system must delete the articles permanently from the system.	O
WDR_04_11	**Update Article Status**	
WDR_04_11_01	The system should allow the admin and the organiser to update the article's status by turning them on or off for regular users.	M
WDR_04_12	**Download Article**	
WDR_04_12_01	The system should allow the organiser, admin, and regular user to download the article.	M
WDR_04_12_02	The system should be able to track how many times normal users download the articles.	M
WDR_05	**View Report**	
WDR_05_01	The admin can view reports for several organisers, proceedings, and articles. Meanwhile, the organiser can view the report for proceedings and articles.	D
WDR_05_02	**View Organizer Report**	
WDR_05_02_01	The system must allow the admin to view the number of registered organisers by country.	M
WDR_05_03	**View Proceeding Report**	
WDR_05_03_01	The admin and organiser should be able to view the report showing the number of proceedings by year and the number of views for each proceeding.	M
WDR_05_04	**View Article Report**	
WDR_05_04_01	The system should allow the admin and organiser to view the report showing each article's views and downloads.	M
WDR_06	**Search Proceeding and Article**	
WDR_06_01	The system must allow the admin, organiser, and normal user to browse articles or proceedings by predefined categories.	M
WDR_06_02	The admin, organiser, and average user can search the articles or proceedings based on the author's name, keyword, and title.	M
WDR_06_03	The system must display the desired articles or proceedings.	M

The requirements outlined in Table 1 were translated into the functional components of the computer system. Subsequently, the next step involves visualising and modelling the website's requirements, utilising the appropriate modelling techniques and tools. The Unified Modeling Language (UML) was employed in this project to visualise and model these requirements. The models used in this context encompass two behavioural diagrams, namely use case and sequence diagrams, alongside a class diagram that encapsulates the structural elements of the application. These diagrams were meticulously crafted using StarUML.

Figure 1 illustrates the use case diagram, delineating the interactions among the use cases and the actors within the website, facilitating the management of conference proceedings articles. This use case diagram involves three distinct actors: the organiser, the admin, and the regular user. Within this framework, four principal use cases are discernible: registration, login/logout, management of organiser accounts, management of proceedings articles, viewing reports, and searching proceedings and articles. The 'Manage Organizer Account' use case permits users to execute subfunctions including "View Information" and "Edit Information," while the 'Manage Proceeding Articles' use case provides users with subfunctions such as "Update Proceeding Status," "Update Article Status," "Download Article," "View Article," and "View Proceeding." Simultaneously, the 'View Report' use case empowers users to undertake subfunctions such as "View Proceeding Report" and "View Article Report."

Figure 1
The Use Case Diagram of WDR



The development of the web-based digital repository for conference proceedings articles culminated in the creation of a functional prototype, as depicted in Figure 1. This illustrative use case diagram captures the essence of the system's functionality and showcases the seamless interactions between the actors and the various use cases inherent to the prototype. Figure 2 shows an example of the prototype interfaces. Within the context of this prototype, three distinct actors play pivotal roles:

1) Organizer: The organiser assumes a central role in coordinating and managing conference proceedings articles, overseeing critical functions that ensure the smooth flow of proceedings-related activities.
2) Admin: The admin, as a critical actor, is entrusted with administrative privileges and responsibilities, enabling efficient governance and oversight of the digital repository.
3) Normal User: The average user represents the broader user base, including researchers, scholars, and stakeholders who use the repository to access, interact with, and contribute to conference proceedings articles.

The prototype encompasses diverse use cases, each tailored to address specific functionalities and actions within the digital repository. These use cases are integral to the repository's seamless operation:

1) Registration: This use case allows users to register their accounts, enabling them to access and contribute to the repository.
2) Login/Logout: Users can securely log in and out of their accounts, ensuring data privacy and controlled access.
3) Manage Organizer Account: This pivotal use case empowers organisers to efficiently oversee and administer their accounts. Subfunctions within this use case include "View Information" and "Edit Information."
4) Manage Proceeding Articles: A cornerstone of the prototype, this use case facilitates the management of conference proceedings articles. Subfunctions include "Update Proceeding Status," "Update Article Status," "Download Article," "View Article," and "View Proceeding."
5) View Report: Users can gain valuable insights by accessing reports related to proceedings and articles. Subfunctions encompass "View Proceeding Report" and "View Article Report."
6) Search Proceeding and Article: The repository offers an efficient search functionality, allowing users to locate and access specific proceedings and articles based on their preferences and criteria.

Figure 2
Example of the Prototype Interfaces



(a) Normal Users



(b) Organizer page



(c) Admin page

EVALUATION AND FINDINGS

Thirty individuals were invited to participate in this study to evaluate the system. The participants, comprised of students and employees at UUM, were selected using a simple random sampling method. Once recruited, each participant was tasked with completing five predetermined assignments before responding to a questionnaire provided through Google Forms. The questionnaire utilised in this study was adapted from the Website Analysis and Measurement Inventory (WAMMI) questionnaire, which assesses five critical factors: attractiveness, controllability, helpfulness, efficiency, and learnability. Section A of the questionnaire inquired about six demographic details of the respondents. In contrast, Sections B through F consisted of four questions, employing a five-point Likert scale where "one" indicated strong disagreement and "five" signified strong agreement. This comprehensive assessment encompassed a total of 26 questions.

An analysis of the demographic data provided insights into the composition of the respondents. Among them, 25 were undergraduates, two were pursuing postgraduate studies, and three represented UUM staff members. In terms of gender distribution, there were 21 female respondents and nine male

respondents. Age-wise, 19 respondents fell within the 21 to 25 age range, while seven were between 26 and 30. Additionally, two respondents were below 21 years old, and two were over 30 in each category. Furthermore, when assessing their internet skills, 18 respondents considered themselves to possess fairly excellent skills, with eight rating their skills as experts. Only four respondents regarded their internet skills as average. Additionally, 16 respondents indicated awareness of the article repository, whereas only five reported prior experience using it. These sections aimed to gauge the respondents' viewpoints concerning the attractiveness, controllability, efficiency, helpfulness, and learnability of WDR. The findings, including the frequency and average of the responses, have been documented in Tables 2 to 7.

Table 2

The Respondents' Responses on the Attractiveness

The post-task questionnaire statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average
I would not say I like using this repository	22 (73.3)	8 (26.7)	0 (0.0)	0 (0.0)	0 (0.0)	4.73
This repository has much that is of interest to me	0 (0.0)	0 (0.0)	8 (26.7)	20 (66.7)	2 (6.7)	3.80
The pages on this repository are beautiful	0 (0.0)	2 (6.7)	10 (33.3)	18 (60.0)	0 (0.0)	3.53
The repository has some annoying features	20 (66.7)	5 (16.7)	5 (16.7)	0 (0.0)	0 (0.0)	4.50
TOTAL						4.14 (82.8%)

Table 3

The Respondents' Responses on the Controllability

The post-task questionnaire statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average
It is not easy to move around this repository	14 (46.7)	16 (53.3)	0 (0.0)	0 (0.0)	0 (0.0)	4.47
Remembering where I am on this repository is difficult	3 (10.0)	22 (73.3)	3 (10.0)	2 (6.7)	0 (0.0)	3.87
I feel in control when I am using this repository	0 (0.0)	0 (0.0)	0 (0.0)	5 (16.7)	25 (83.3)	4.83
I can quickly contact the people I want	0 (0.0)	0 (0.0)	8	19	3 (10.0)	3.83

to on this repository			(26.7)	(63.3)		
TOTAL						4.25 (85%)

Table 4
The Respondents' Responses on the Efficiency

The post-task questionnaire statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average
This repository is too slow	26 (86.7)	4 (13.3)	0 (0.0)	0 (0.0)	0 (0.0)	4.87
Using this repository is a waste of time	27 (90.0)	3 (10.0)	0 (0.0)	0 (0.0)	0 (0.0)	4.90
I can easily find what I want on this repository	0 (0.0)	0 (0.0)	2 (6.7)	25 (83.3)	3 (10.0)	4.03
I feel efficient when I am using this repository	0 (0.0)	0 (0.0)	3 (10.0)	25 (83.3)	2 (6.7)	3.97
TOTAL						4.44 (88.85%)

Table 5
The Respondents' Responses on the Helpfulness

The post-task questionnaire statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average
This repository seems logical to me	0 (0.0)	0 (0.0)	0 (0.0)	19 (63.3)	11 (36.7)	4.37
This repository helps me find what I am looking for	0 (0.0)	0 (0.0)	0 (0.0)	26 (86.7)	4 (13.3)	4.13
It is difficult to tell if this repository has what I want	0 (0.0)	22 (73.3)	8 (26.7)	0 (0.0)	0 (0.0)	3.73
I get what I expect when I click on things in this repository	0 (0.0)	0 (0.0)	0 (0.0)	10 (33.3)	20 (66.7)	4.67
TOTAL						4.23 (84.5%)

Table 6

The Respondents' Responses on the Learnability

The post-task questionnaire statements	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Average
Learning to find my way around this repository is a problem	10 (33.3)	20 (66.7)	0 (0.0)	0 (0.0)	0 (0.0)	4.33
This repository needs more introductory explanations	0 (0.0)	20 (66.7)	0 (0.0)	10 (33.3)	0 (0.0)	3.33
Using this repository for the first time is easy	0 (0.0)	0 (0.0)	0 (0.0)	7 (23.3)	23 (76.7)	4.77
Everything on this repository is easy to understand	0 (0.0)	0 (0.0)	2 (6.7)	22 (73.3)	6 (20.0)	4.13
TOTAL						4.14 (82.8%)

Table 7

The Respondents' Positive Responses on Each Usability Factors

Usability Factors	Percentage Of Positive Responses
Attractiveness of WDR	79.2%
Controllability of WDR	82.5%
Efficiency of WDR	95.8%
Helpfulness of WDR	93.3%
Learnability of WDR	90%

The evaluation results indicate that WDR has achieved high satisfaction levels across all usability factors, with satisfaction percentages exceeding 80% for each factor. On average, respondents expressed the highest satisfaction levels with the system's efficiency, controllability, and helpfulness, scoring 88.85%, 85%, and 84.5%, respectively. Additionally, respondents displayed overall satisfaction rates of 82.8% for both attractiveness and learnability.

Furthermore, respondents conveyed positive feedback regarding the efficiency, helpfulness, and learnability aspects, with satisfaction levels of 95.8%, 93.3%, and 90%, respectively. Controllability received a positive response from 82.5% of respondents. Notably, only the aspect of attractiveness fell slightly below the 80% threshold, garnering a satisfaction rate of 79.2%.

These findings underscore that most respondents are content with the Web-based Digital Repository System (WDR). However, some elements still elicited disagreement or dissatisfaction among participants. Therefore, enhancing the system's user interface to enhance user-friendliness and appeal could be considered to increase user engagement with the repository. Additionally, there is room for improving the system's functionality to achieve higher satisfaction and consensus regarding usability.

CONCLUSION AND FUTURE WORKS

The Web-based Proceedings Repository is an asset within the academic realm. It provides a vital tool for the dissemination and accessibility of conference proceedings in an era when these attributes are of the utmost importance. This repository offers an effective solution for managing and retrieving conference proceedings, catering to the needs of researchers, academics, and conference organisers. One of the repository's prominent strengths lies in its user-friendly interface. With its well-structured and intuitive design, users can effortlessly navigate the extensive collection of conference proceedings. This feature dramatically facilitates locating specific proceedings, rendering it an indispensable resource within the academic community. Moreover, the repository's commitment to open access is laudable. By granting online access to conference proceedings, it fosters transparency and inclusivity in academia. This open-access approach benefits researchers and encourages broader knowledge sharing, thereby contributing to the advancement of various academic disciplines.

The repository boasts a robust search functionality that enables swift retrieval of relevant proceedings. Additionally, the capability to generate reports enhances convenience, aiding administrators and organisers in effectively managing their respective proceedings. One of its paramount strengths lies in its role as a custodian of academic knowledge. With a long-term sustainability and reliability focus, the repository ensures the continued accessibility of conference proceedings for posterity. This aspect is pivotal in preserving the historical record of scholarly discourse. Advanced collaboration features can be incorporated for future enhancements, enabling researchers to connect and exchange insights within the platform. Furthermore, integration with citation management tools would further streamline the research process for users.

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